Together with #4 Aberdeen Motor Co. v. Cleveland Trust Co.; Chrysler Corp. and #5 F.E. Rowe Sales Co. v. Cleveland Trust Co.; Chrysler Corp.

Vol. I

TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1938

No. 3

THE SCHRIBER-SCHROTH COMPANY,
PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 4

THE ABERDEEN MOTOR SUPPLY COMPANY,
PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 5

THE F. E. ROWE SALES COMPANY, PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

ON WRITS OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT.

PETITION FOR CERTIORARI FILED JANUARY 7, 1938.

CERTIORARI GRANTED MAY 31, 1938.

United States Circuit Court of Appeals

FOR THE EIGHTH CIRCUIT.

THE CLEVELAND TRUST COMPANY, CLEVELAND, OHIO,
Plaintiff-Appellant,
vs.
THE SUPERIOR-SUPERIOR COMPANY,
Defendant-Appellee.
No. 4045. EQUITY.

THE CLEVELAND TRUST COMPANY, CLEVELAND, OHIO,
Plaintiff-Appellant,
vs.
THE ASHTABULA WATER SUPPLY COMPANY,
Defendant-Appellee.
No. 4046. EQUITY.

THE CLEVELAND TRUST COMPANY, CLEVELAND, OHIO,
Plaintiff-Appellant,
vs.
THE F. B. ROWE STEEL COMPANY,
Defendant-Appellee.
No. 4047. EQUITY.

Appeals from

THE [illegible] DISTRICT OF OHIO.

[illegible]

[illegible]

[illegible]

United States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,

vs.

THE SCHRIBER-SCHROTH COMPANY,
Defendant-Appellee.

No. 4045.
EQUITY.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,

vs.

THE ABERDEEN MOTOR SUPPLY COMPANY,
Defendant-Appellee.

No. 4046.
EQUITY.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,

vs.

THE F. E. ROWE SALES COMPANY,
Defendant-Appellee.

No. 4047.
EQUITY.

APPEALS FROM
THE DISTRICT COURT OF THE UNITED STATES,
FOR THE NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION.

TRANSCRIPT OF RECORD

VOLUME I.

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3.	U. S. Patent No. 1,763,523, June 10, 1930, to F. Jardine (Patent in Suit)	51	1291
4.	U. S. Patent No. 1,655,968, Jan. 10, 1928, to H. E. Maynard (Patent in Suit)	51	1299
5.	U. S. Patent No. 1,256,265, Feb. 12, 1918, to V. E. Schmiedeknecht (Patent in Suit)	51	1305
6.	U. S. Patent No. 1,402,309, Jan. 3, 1922, to L. P. Mooers (Patent in Suit)	51	1309

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U. S. Patents:

No. 700,309	May 20, 1902	H. E. Ebbs	1671
No. 908,569	Jan. 5, 1909	F. D. Howe	1675
No. 1,031,212	Jul. 2, 1912	E. Van Bever	1679
No. 1,092,870	Apr. 14, 1914	E. O. Spillman and L. P. Mooers	1683
No. 1,153,902	Sept. 21, 1915	G. E. Franquist	1687
No. 1,174,092	Mar. 7, 1916	W. L. Schoengarth	1693
No. 1,195,936	Aug. 22, 1916	C. White	1699

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No. 1,229,540	June 12, 1917	E. O. Spillman	1703
No. 1,279,184	Sept. 17, 1918	J. G. Vincent	1707
No. 1,283,021	Oct. 29, 1918	C. C. Anderson	1713
No. 1,294,833	Feb. 18, 1919	H. R. Ricardo	1717
No. 1,325,176	Dec. 16, 1919	A. Spillman	1723
No. 1,395,441	Nov. 1, 1921	E. C. Long	1727
No. 1,489,499	Apr. 8, 1924	E. C. Long	1731
No. 1,872,772	Aug. 23, 1932	E. C. Long	1735

British Patents:

No. 19,559 of 1890	James Roots	1739
No. 17,256 of 1907	John Vernon Pugh	1743
No. 6,826 of 1912	William Frederick Rainforth	1751
No. 12,772 of 1914	Samuel Octavius Ferry	1755
Specification 140,988	Ernest Walter Hives	1759

French Patents:

No. 468,595 of 1914	Chenard and Walcker	1763
	(Translation of foregoing)	1767
No. 434,147 of 1911	M. Chas.-Emile Serex	1769
	(Translation of foregoing)	1773
No. 16,362 of 1912	M. Chas.-Emile Serex	1777
	(Translation of foregoing)	1781

German Patent:

No. 176,988 of 1906	Otto Lietzenmayer	1785

Additional U. S. Patents:

No. 1,557,625	Oct. 20, 1925	L. M. Stellmann	1789
No. 1,842,022	Jan. 19, 1932	S. D. Hartog	1797
No. 1,499,073	June 24, 1924	L. H. Pomeroy	1803

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CAPTION.

[Case No. 4045.]

UNITED STATES OF AMERICA,
NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION, ss.

Record of the proceedings of the District Court of the United States within and for the Eastern Division of the Northern District of Ohio, in the causes and matters hereinafter stated, the same being finally disposed of at a regular term of said court begun and held at the City of Cleveland, in said district, on the first Tuesday in April, being the third day of said month, in the year of our Lord one thousand nine hundred and thirty-four and in the one hundred and fifty-eighth year of the Independence of the United States of America, to-wit, on Friday, the 27th day of July, A. D. 1934.

Honorable PAUL JONES,
United States District Judge.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
vs.
THE SCHRIBER-SCHROTH COMPANY. } No. 4045 EQUITY.

Said action was commenced on the 17th day of October, A. D. 1931 and proceeded to final disposition at the term and day above written and during the progress thereof pleadings and papers were filed, process was issued and returned and orders of the court were made and entered in the order and on the dates hereinafter stated, to-wit:

ORIGINAL BILL OF COMPLAINT.

(Filed October 17, 1931.)

[Case No. 4045.]

To the Honorable Judges of the United States District Court for the Northern District of Ohio, Eastern Division:

Plaintiffs, for their Bill of Complaint, allege:

1.

That Plaintiff, The Cleveland Trust Company, is a corporation organized and existing under the laws of the State of Ohio, having its principal place of business at Cleveland, State of Ohio.

That Plaintiff, Chrysler Corporation, is a corporation organized and existing under the laws of the State of Delaware, having its principal place of business at Highland Park, State of Michigan.

2.

That Defendant, The Schriber-Schroth Company of Akron, Ohio, is a corporation organized and existing under the laws of the State of Ohio and is a citizen and inhabitant thereof, having a regular and established place of business at 61 West Market Street, Akron, County of Summit and State of Ohio.

That Defendant, Sterling Products Corporation of St. Louis, Missouri, is a corporation duly organized and existing under the laws of the State of Missouri and has a regular and established place of business at 2914 North Market Street in the City of St. Louis, County of St. Louis, and State of Missouri.

3.

This suit is brought under the patent laws of the United States, and seeks injunctive and other relief against the defendants and each of them for infringements and contributory infringements committed by each and both defendants within this Judicial District and elsewhere within the United States.

4.

That heretofore and prior to the 2nd day of June, 1917, Louis P. Mooers, a citizen of the United States, then residing at Cincinnati, Hamilton County, State of

Ohio, was the original, first and true inventor of certain new and useful improvements in Pistons for Internal Combustion Motors, fully described in Letters Patent of the United States No. 1,402,309, hereinafter mentioned, which invention or improvement was not known or used by others in this country or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his application for said Letters Patent; had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States therefor; that the said Louis P. Mooers made due application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress, for Letters Patent of the United States for said invention and improvement.

5.

That by an instrument in writing duly executed and delivered by said Louis P. Mooers and duly recorded in the United States Patent Office in Liber P-103, page 133 of the Transfers of Patents, said Louis P. Mooers assigned an undivided half of the entire right, title and interest in, and to said invention and improvement and in and to said application for Letters Patent to George B. Pitts of Cleveland, Ohio and authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for said invention and improvement to said George B. Pitts and Louis P. Mooers; and by said instruments in writing specified in Article 3 of this Bill as recorded in Liber Q-107, pages 336 and 339 of the Transfers of Patents, said George B. Pitts and Louis P. Mooers respectively each assigned his undivided one-half of the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,402,309 to your Orator, The Cleveland Trust Company, and authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for said invention and improvement to said The Cleveland Trust Company; whereby your Orator became vested with and holds the entire right, title and in-

terest in, to and under said Letters Patent No. 1,402,309, as will more fully and at large appear upon production in Court of the said Letters Patent and the assignments aforesaid.

6.

That heretofore and prior to the 14th day of July, 1917, Victor E. Schmiedeknecht, a citizen of the United States then residing at Louisville in the County of Jefferson and State of Kentucky, was the first and true inventor of certain new and useful improvements in Pistons, fully described in Letters Patent of the United States No. 1,256,265, hereinafter mentioned, which invention and improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his application for said Letters Patent; had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States therefor; that the said Victor E. Schmiedeknecht made due application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress, for Letters Patent of the United States for said invention and improvement, and having in all respects complied with the conditions and requirements of said Acts of Congress, on the 12th day of February, 1918, Letters Patent of the United States No. 1,256,265, signed, sealed and executed in due form of law for the said invention or improvement, were issued and delivered unto said Victor E. Schmiedeknecht, his successors and assigns, for the term of seventeen years from said 12th day of February, 1918, the sole and exclusive right to make, use and sell to others to be used, throughout the United States and the territories thereof, the aforesaid invention or improvement, all as by said Letters Patent or a duly authenticated copy thereof in Court to be produced and shown to Your Honors will more fully and at large appear.

7.

That subsequent to the granting of the aforesaid Letters Patent No. 1,256,265, by an instrument in writing that was duly recorded in the United States Patent Office on or about the 16th day of August, 1927 in Liber F-131, page 79 of the Transfers of Patents, said Victor E. Schmiedeknecht assigned the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,256,265, together with the right to sue for, collect, and retain damages and profits for past infringement under said Letters Patent to one Frank Kent of New York City; and, whereas this assignment was further amplified by further warranty and guarantee that was also recorded in the United States Patent Office on or about the 16th day of August, 1927 in Liber P-131, page 81 of the Transfers of Patents; whereby said Frank Kent, his successors and assigns, became vested with the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,256,265, together with the right to sue for, collect, and retain damages and profits for past infringements of said Letters Patent.

8.

That by an instrument in writing dated October 12, 1927 and duly recorded in the United States Patent Office in the Transfers of Patents, said Frank Kent assigned the entire right, title and interest in, to and under said Letters Patent of the United States, together with the right to sue, collect, and retain damages and profits for past infringement, to Bohn Aluminum & Brass Corporation of Detroit, Michigan, its successors and assigns.

9.

That said Bohn Aluminum & Brass Corporation, by an instrument in writing dated on or about October 31st, 1927, and recorded in the United States Patent Office in Liber C-133, page 618 of the Transfers of Patents, assigned to Your Orator, The Cleveland Trust Company, its successors and assigns, the entire right, title and interest in, to and under said Letters Patent, together with the right to sue for, collect and retain damages and profits for past infringements of said Letters Patent; whereby plaintiff, The Cleveland Trust Company, became vested with and now holds the entire right, title and interest in, to and under the aforesaid Letters Patent No. 1,256,265,

and the right to sue for, collect, and retain damages and profits for past infringement of said Letters Patent, as will more fully and at large appear upon production in this Court of the assignments aforesaid or duly authenticated copies thereof.

10.

That heretofore, and prior to the third day of January, 1921, Howard E. Maynard, then residing at Detroit, in the County of Wayne and State of Michigan, was the original, first and true inventor of certain new and useful improvements in Pistons fully described in Letters Patent of the United States No. 1,655,968 hereinafter mentioned, which invention or improvement was not known or used by other in this country, or patented or described in any printed publication in this or any foreign country before his said invention or discovery thereof, or more than two years prior to his application for Letters Patent therefor, and had not been in public use or on sale in this country for more than two years prior to his application for Letters Patent therefor; and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of the application for Letters Patent thereon in this country.

11.

That the said Howard E. Maynard, being as aforesaid, the inventor of the said improvement, made application to the Commissioner of Patents of the United States for Letters Patent in accordance with the then existing Acts of Congress, and, having in all respects complied with the conditions and requirements of said Acts of Congress, on the tenth day of January, 1928 Letters Patent of the United States numbered 1,655,968, signed, sealed and executed in due form of law, for the said invention or improvement, were issued to said Chrysler Corporation, a corporation of Delaware, at Highland Park, Michigan, plaintiff, and Aluminum Company of America, a corporation of Pennsylvania, at Pittsburgh, Pa., as assignees each of one-half of the entire right, title and interest in and to said Letters Patent, whereby there was secured to Chrysler Corporation and Aluminum Company of America for the term of seventeen years from the tenth day of January, 1928, the sole and

exclusive right to make, use and sell to others to be used throughout the United States and the territories thereof, the aforesaid invention or improvement, all as by said Letters Patent, or a duly authenticated copy thereof here in Court to be produced and shown unto Your Honors, as will more fully and at large appear.

12.

That prior to the filing of this Bill of Complaint, said Aluminum Company of America, by an instrument in writing dated February 23, 1928 and recorded in the Transfers of Patents in the United States Patent Office as of May 12, 1930 in Liber Z-143, page 283, assigned its undivided one-half interest in the entire right, title and interest in and to said Letters Patent No. 1,655,968 to The Cleveland Trust Company, plaintiff herein, together with the right to sue for and recover damages for past infringements of said Letters Patent, whereby your plaintiff, The Cleveland Trust Company, became vested with and now holds an undivided one-half interest in the entire right, title and interest in, to, and under said Letters Patent No. 1,655,968, as will more fully and at large appear upon production in Court of the assignments aforesaid.

13.

That the plaintiff, Chrysler Corporation, is a non-resident and resides without the jurisdiction of this Court and therefore cannot be served with process and made a co-defendant in this cause, and that plaintiff, The Cleveland Trust Company, has advised Chrysler Corporation of the imminent pendency of this case and of the obligation of Chrysler Corporation to join voluntarily in the bringing of this suit, but that Chrysler Corporation has refused or declined to so voluntarily join and that the plaintiff, The Cleveland Trust Company, is without remedy on the Maynard patent unless Chrysler Corporation is joined as a co-plaintiff in this cause, and therefore to prevent a failure of justice and to enable The Cleveland Trust Company to protect its interests herein, the Chrysler Corporation is made a plaintiff herein without its consent.

14.

That heretofore and prior to the 11th day of March, 1920, Frank Jardine, a citizen of the United States, then

residing at Cleveland, in the County of Cuyahoga and State of Ohio, was the original, first and true inventor of certain new and useful improvements in Pistons, fully described in Letters Patent of the United States No. 1,763,523, hereinafter mentioned, which invention or improvement was not known or used by others in this country or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his application for said Letters Patent; had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States therefor; that the said Frank Jardine made due application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress, for Letters Patent of the United States for said invention and improvement, and having in all respects complied with the conditions and requirements of said Acts of Congress, and having, by mesne assignments, as will more fully and at large appear upon production in Court of said assignments, assigned his entire right, title and interest in and to said Letters Patent No. 1,763,523 to The Cleveland Trust Company, as Trustee, and having authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for said invention and improvements to said The Cleveland Trust Company, on or about the 10th day of June, 1930, Letters Patent of the United States No. 1,763,523, signed, sealed and executed in due form of law, for the said invention or improvement, were issued and delivered to plaintiff, The Cleveland Trust Company, whereby there was secured to it, its successors and assigns, for the term of seventeen years from the said 10th day of June, 1930, the sole and exclusive right to make, use, and sell to others to be used, throughout the United States and the territories thereof, the aforesaid invention or improvement, all as by said Letters Patent or a duly authenticated copy thereof in Court to be produced and shown unto Your Honors, will more fully and at large appear.

15.

That heretofore and prior to the 30th day of November, 1917, Edward J. Gulick, a citizen of the United States then residing in Mishawaka, County of St. Joseph, and State of Indiana, was the original, first and true inventor of certain new and useful improvements in Pistons, fully described in application for Letters Patent of the United States, Serial No. 204,661, which invention was not known or used by others in this country or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his said application for Letters Patent therefor; that said invention had not been in public use or on sale in this country for more than two years prior to said application for Letter Patent, had not been abandoned to the public and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of said application for Letters Patent of the United States; that on or about November 30, 1917, said Edward J. Gulick made due application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress, for Letters Patent of the United States for said invention or improvements and, having in all respects complied with the conditions and requirements of said Acts of Congress, on the 21st day of July, 1931, Letters Patent of the United States No. 1,815,733 were signed, sealed and executed in due form of law for the said invention, and were issued and delivered unto Plaintiff, The Cleveland Trust Company, its successors and assigns, as assignee of the entire right, title and interest of said Edward J. Gulick, for the term of seventeen years from said 21st day of July, 1931, thereby granting to it the sole and exclusive right to make, use and sell to others to be used, throughout the United States, its territories and dependencies, the aforesaid invention or improvements, all as by said Letters Patent or a duly authenticated copy thereof in Court to be produced and shown to Your Honor, as will more fully and at large appear.

16.

That prior to the grant of aforesaid Letters Patent No. 1,815,733, said Edward J. Gulick assigned to the Packard Motor Car Company of Detroit, Michigan, his

entire right, title, and interest in and to the invention set forth and described in the aforesaid application for Letters Patent Serial No. 204,661 by an instrument in writing dated Nov. 23, 1917 that was duly recorded in the United States Patent Office on or about the 30th day of November, 1917, in Liber J-103, page 468 of the Transfers of Patents; whereby said Packard Motor Car Company of Detroit, Michigan, its successors and assigns became vested with the entire right, title and interest in and to the aforesaid invention and in and to said application for Letters Patent Serial No. 204,661 and in and to any Letters Patent issuing pursuant thereto.

17.

That, on or about September 11, 1922 and prior to the grant of aforesaid Letters Patent No. 1,815,783, the Packard Motor Car Company of Detroit, Michigan, assigned to The Cleveland Trust Company of Cleveland, Ohio, its entire right, title and interest in and to the invention set forth and described in the aforesaid application for Letters Patent Serial No. 204,661 and in and to said application for Letters Patent by an instrument in writing dated September 11, 1922 that was duly recorded in the United States Patent Office on or about the 13th day of September, 1922, in Liber S-116, page 485 of the Transfers of Patents, whereby said The Cleveland Trust Company of Cleveland, Ohio, its successors and assigns became vested with, has continuously held and now owns the entire right, title and interest in and to said invention and in and to said application for Letters Patent Serial No. 204,661 and in and to said Letters Patent of the United States No. 1,815,783 that issued pursuant thereto.

18.

That the validity of each of the aforesaid Letters Patent has been recognized and acquiesced in by the public generally since the date of issue of each of said patents, except for these defendants and others encouraged by them. At various times said patents have been especially recognized and acquiesced in by parties who have discontinued infringement thereof and who have made due amends to plaintiff. Others have taken licenses under said patents. Substantial and material royalties have been paid to the plaintiff under said patents. The licensees under said patents have manufactured and sold the pistons covered by said patents in great numbers.

These pistons have gone into extensive and successful use. Licensees under said patents have built plants and established organizations for the manufacture and sale of such pistons on the strength of and by reason of their confidence in the patents here in suit.

19.

That the plaintiff has duly notified each and both of these defendants of their infringement of each of the aforesaid Letters Patent and has requested them and each of them to desist, but defendants and each of them have continued their infringements in defiance of said notices.

20.

These defendants, The Schriber-Schroth Company and Sterling Products Corporation, jointly and severally, subsequent to the grant of said Letters Patent and prior to the filing of this Bill of Complaint and within six years hereof, with full knowledge of each of said Letters Patent and without the consent of plaintiff, The Cleveland Trust Company, but in violation of its rights, and after due notice, has within the Judicial District of this Court and elsewhere within the United States, infringed each of the aforesaid Letters Patent and contributed to the infringement thereof by making and/or causing to be made, by using and/or causing to be used, and selling and/or causing to be sold in this Judicial District and elsewhere within the United States, Pistons for Internal Combustion Engines embodying jointly and severally the inventions of said Letters Patent and in infringement thereof.

That in so infringing, defendants have realized and received great gains and profits which should, and otherwise would have been received by plaintiffs, each and both of them, and defendants, and each and both of them, have correspondingly inflicted on plaintiffs great loss and damage, but to what extent plaintiffs cannot now set forth and therefore pray discovery with respect thereto; that plaintiffs fear and have reason to fear that defendants will continue their aforesaid infringing acts to an even greater extent unless enjoined by this Honorable Court; and defendants, and each of them, have and will thereby induce others to venture to infringe the said Letters Patent aforesaid, to the irreparable injury of plaintiffs.

21.

That suit was heretofore instituted in this Honorable Court by Plaintiffs in this cause against The Simmons Manufacturing Company of Cleveland, Ohio and Sterling Products Corporation of St. Louis, Missouri, Co-Defendants, for the infringement of the foregoing Letters Patent of the United States by the use and sale of pistons of the same construction that is herein charged to infringe and that a consent decree was entered against defendant, The Simmons Manufacturing Company, on September 25, 1931 and that said The Simmons Manufacturing Company was also enjoined from further using or selling said infringing pistons.

22.

Because of these premises, plaintiffs are without adequate or sufficient remedy at law and therefore bring this suit in equity.

Wherefore, the plaintiffs pray:

First. That a writ of subpoena ad respondum may issue out of and under the seal of this Court requiring each and both of said defendants, The Schriber-Schroth Company and Sterling Products Corporation, to appear and make answer to this Bill of Complaint, but not under oath, answer under oath being hereby expressly waived, to the best and utmost of their knowledge, information and belief and to do and perform such things as to this Court may seem meet and just;

Second. That this Court may grant an injunction, perpetual as well as temporary, enjoining each and both of said defendants, The Schriber-Schroth Company and Sterling Products Corporation, as well as each of the directors, officers, associates, successors, agents, attorneys and employees, and every person acting for or on the behalf of each and/or both of said defendants, from further infringing or contributing to the infringement of any and/or each of said Letters Patent.

Third. That said defendants, The Schriber-Schroth Company and Sterling Products Corporation, and each and both of them, may be required to account before a Master in the usual manner of accountings for the gains, profits and advantages due to and arising out of their aforesaid infringements and contributory infringements herein complained about, as well as the damages sus-

tained by plaintiffs, by reason of said infringements, and that the said damages be tripled.

Fourth. That said defendants, The Schriber-Schroth Company and Sterling Products Corporation, each and both of them, be required to pay over to plaintiffs, the gains and profits so accounted for and also the damages sustained by plaintiffs as the result of said infringements and contributory infringements.

Fifth. That the defendants, each and both of them, be decreed to pay the costs, charges and disbursements of this suit.

Sixth. That the plaintiffs may have such other and further relief as the equity of the case may require, and as to this Honorable Court may seem just and proper.

THE CLEVELAND TRUST COMPANY,
By R. A. MALM,
Vice-President.

CHRYSLER CORPORATION,
By R. A. MALM,
Vice-President, The Cleveland Trust Company.

WM. C. McCOY,
Solicitor for Plaintiffs.

AFFIDAVIT.

STATE OF OHIO,
COUNTY OF CUYAHOGA, ss.:

On this 15th day of October, 1931, before the undersigned, a Notary Public within and for the County and State aforesaid, personally appeared R. A. Malm and made oath that he is the Vice President of The Cleveland Trust Company, the above named complainant, that he has read the foregoing Bill of Complaint, and knows the contents thereof, and that the same is true, except as to those matters stated on information and belief, and as to those matters he believes it to be true.

JOHN T. MOORE,
Notary Public.

(Notarial Seal)

MOTION OF DEFENDANT, THE SCHRIBER-SCHROTH COMPANY FOR FURTHER AND BETTER STATEMENT AND FURTHER PARTICULARS.

(Filed November 9, 1931.)

[Case No. 4045.]

Now comes The Schriber-Schroth Company, defendant in the above-entitled cause, and moves that Plaintiff The Cleveland Trust Company be ordered, under the provisions of Equity Rule 20, to furnish a further and better statement of the nature of plaintiffs' claim and further and better particulars of the matters stated in the Bill of Complaint in the following respects:

I. With reference to each and all of the patents in suit, state:

A. Does The Cleveland Trust Company hold both the legal title and the beneficial interest or equitable title to said patents?

B. Does The Cleveland Trust Company hold title as trustee?

C. List the holders of beneficial interests, and the proportions or percentages or shares of such beneficial interests.

D. Is Bohn Aluminum & Brass Corporation, mentioned in paragraph 8 of the Bill, a holder of a beneficial interest?

E. Is Aluminum Company of America, mentioned in paragraph 11 of the Bill, a holder of a beneficial interest?

F. Is Packard Motor Car Company, mentioned in paragraph 16 of the Bill, a holder of a beneficial interest?

G. Furnish a copy, or copies, of all agreements or declarations of trust, and amendments or additions thereto, by virtue of which The Cleveland Trust Company may hold title for beneficiaries or cestuis que trustent.

II. With reference to paragraph 14 of the Bill, list the assignments referred to as "mesne assignments."

III. With reference to paragraph 18 of the Bill, name the licensees who are holders of beneficial interests under any agreement or declaration of trust by virtue of which The Cleveland Trust Company holds title to any or all of the patents in suit.

IV. With reference to paragraph 20 of the Bill:

A. Furnish a sample, specimen, drawing, or illustration of the piston which will be relied upon at the trial as having been sold by Defendant The Schriber-Schroth Company; and if there is more than one piston, furnish a sample, specimen, drawing, or illustration of each of the pistons which will be relied upon at the trial.

B. Specify the claims in each patent which will be relied upon at the trial as infringed by Defendant, The Schriber-Schroth Company; and as to these, particularize by patent number and claim with reference to each piston, if more than one.

C. Does The Cleveland Trust Company manufacture or sell any pistons coming within the scope of any or all of the patents in suit and as to which loss and damage are alleged?

And Defendant further moves that an Order be entered that Plaintiff The Cleveland Trust Company file such particulars and serve upon Defendant The Schriber-Schroth Company a copy of the same, together with copies of all exhibits, within fifteen (15) days after the entry of said Order. And defendant further moves that such Order as to costs be made herein as may be just.

THE SCHRIBER-SCHROTH COMPANY,
By KWIS, HUNSON & KENT,
Solicitors.

Cleveland, Ohio,
November 5, 1931.

Service of a copy of the foregoing Motion is acknowledged this 9th day of November, 1931.

WM. C. McCOY,
Solicitors for Plaintiffs.

ORDER ON MOTION OF DEFENDANT THE SCHRIBER-SCHROTH COMPANY FOR FURTHER AND BETTER STATEMENT AND FURTHER PARTICULARS, OVERRULING ALL BUT PARAGRAPH IV B.

(Entered December 30, 1931 by Paul Jones, Judge.)

This day this cause came on to be heard on the motion of defendant The Schriber-Schroth Company for further and better statement and further particulars, and was submitted to the Court; on consideration thereof the Court overruled said motion as to all paragraphs except IV B, and granted said motion as to paragraph IV B.

PLAINTIFF'S BILL OF PARTICULARS.

(Filed January 8, 1932.)

[Case No. 4045.]

Now come the Plaintiffs and, for their Bill of Particulars in response to Section IV B of the motion of Defendant, The Schriber-Schroth Company, and in accordance with the Court Order of December 30, 1931 regarding the aforesaid motion, state as follows:

At the trial of this cause Plaintiffs intend to rely on the following claims of the patents listed as infringed and/or as contributorily infringed by Defendant:

Mooers Patent, No. 1,402,309, Claims 1, 2, 6, 9 and 10.

Schmiedeknecht Patent, No. 1,256,265, Claims 1 and 3.

Maynard Patent, No. 1,655,968, All of the claims.

Jardine Patent, No. 1,763,523, All claims except 3 and 12.

Gulick Patent, No. 1,815,733, Claims 1, 11, 12, 13, 15, 18, 30, 33, 35, 38, 41, 42 and 43.

Plaintiffs intend to rely on pistons like Plaintiffs' Exhibit 1 (submitted herewith) and pistons of the same kind in which the longitudinal slot in the piston skirt is completed for installation in an engine by cutting the longitudinal slot through at the top and bottom of the skirt, as indicated in pencil on the accompanying piston, Plaintiffs' Exhibit 1, as the infringing pistons.

Respectfully submitted,

WM. C. MCCOY,
Attorney for Plaintiffs.

Service and receipt of copy of foregoing Bill of Particulars acknowledged this ... day of January, 1932.

KWIS, HUDSON & KENT,
Attorneys for Defendant, The Schriber-Schroth Company.

PETITION OF JOHN H. BRUNINGA TO ENTER HIS SPECIAL APPEARANCE, IN ORDER TO ENTER A SPECIAL APPEARANCE ON BEHALF OF STERLING PRODUCTS CORPORATION, FOR THE SOLE AND ONLY PURPOSE OF OBJECTING TO THE JURISDICTION.

(Filed November 9, 1931.)

[Case No. 4045.]

Now comes John H. Bruninga and states:

That he is attorney at law, admitted to practice before the Supreme Court of the United States and the District Court of the United States for the Eastern District of Missouri, and that he resides in the City of St. Louis, State of Missouri.

That Sterling Products Corporation is a corporation duly organized and existing under the laws of the State of Missouri and has its principal and only place of business in the City of St. Louis, State of Missouri; and that said Sterling Products Corporation has no office nor place of business, nor any regular and established place of business, nor any agent within the Northern District of Ohio or within the jurisdiction of this Court. That said Sterling Products Corporation has not been served with process in the above-entitled cause and has not entered its appearance in that cause.

That a few days after May 17, 1930, said Sterling Products Corporation received from Evans & McCoy, solicitors for plaintiffs in the above-entitled cause, a letter dated May 17, 1930, photostat of which is attached hereto, and the original of which will be produced in Court, but that to date no suit has been brought against Sterling Products Corporation at the only place where it can be served—namely, St. Louis, Missouri.

That on September 29, 1930, suit was instituted in this Court by plaintiffs against The Simmons Manufacturing Company, naming said Sterling Products Corporation as a defendant, said suit being entitled Equity No. 3510; but that said Sterling Products Corporation was not served with process nor did it enter its appearance in that cause.

That on November 24, 1930, John H. Bruninga, patent counsel for said Sterling Products Corporation, sent a letter, photostat of a carbon copy of which is attached hereto, and the original of which is in the possession of Evans & McCoy, solicitors for plaintiffs in the above-

entitled cause, as the same was acknowledged; but that to date no suit has been brought against Sterling Products Corporation, at the only place where it can be legally served—namely, St. Louis, Missouri.

That on September 25, 1931, a consent decree, entitled "Interlocutory Decree," was entered in said suit Equity No. 3510, but said decree was consented to only by The Simmons Manufacturing Company, the defendant in that cause, and that Sterling Products Corporation was not a party to said decree and did not consent to said decree.

That on October 1, 1931, plaintiffs filed a motion in said cause, Equity No. 3510, entitled "Motion for an Order to Proceed before the Master to Take Testimony to Show That the Decree Entered September 25, 1931, against the defendant The Simmons Manufacturing Company Should Be Extended to Apply to Sterling Products Corporation, and for a Report of the Master on This Subject," and that said motion stated that "Sterling Products Corporation therefore conducted the defense of the suit to the exclusion of The Simmons Manufacturing Company and paid for the defense of the suit to their exclusion."

That on October 9, 1931, said Evans & McCoy sent a letter to Chicago Auto Parts, Inc., of Chicago, Illinois, one of the customers of said Sterling Products Corporation, which letter stated, "We are advised that Sterling Products Corporation refused to furnish a bond to The Simmons Manufacturing Company and to contest the suit on the merits in behalf of The Simmons Manufacturing Company." A photostat of said letter is attached hereto, and the original will be produced in Court.

That on October 10, 1931, said Evans & McCoy sent a letter to Automotive-Supply Co., Inc., of Appleton, Wisconsin, one of the customers of said Sterling Products Corporation, which again stated, "We are advised that Sterling Products Corporation refused to furnish a bond to the Simmons Manufacturing Company and to contest the suit on the merits in behalf of The Simmons Manufacturing Company"; and further stated that "Sterling Products Corporation was also made a party defendant in this suit." A photostat of said letter is attached hereto, and the original will be produced in Court.

That, in addition to the above-entitled suit, the plaintiffs have recently filed two other suits against the following parties:

The Aberdeen Motor Supply Company, Equity No. 4046

The F. E. Rowe Sales Company, Equity No. 4047

again naming Sterling Products Corporation; but that said Sterling Products Corporation has not been served with process, nor has it entered its appearance in either of said causes.

That by naming Sterling Products Corporation in the above-entitled cause, Sterling Products Corporation is liable to be prejudiced, particularly since, as in said Equity Cause No. 3510, filed by plaintiffs against The Simmons Manufacturing Company, the Sterling Products Corporation's relation is not only liable to be misconstrued, but such naming taken advantage of by incorrect statements of fact and law, as in said letters aforesaid.

Now, therefore, I, the said John H. Bruninga, pray leave to appear before this Court, to enter my special appearance in this cause, in order to enter a special appearance on behalf of said Sterling Products Corporation, for the sole and only purpose of objecting to the jurisdiction of this Court and for the purpose of praying this Court:

First, to dismiss the above-entitled cause as to Sterling Products Corporation, because this Court is without jurisdiction or power over Sterling Products Corporation.

Second, to expunge the name of Sterling Products Corporation from the Bill of Complaint in the above-entitled cause.

The undersigned, therefore, prays for an oral hearing before this Court and that this Court direct such an oral hearing and grant leave for said Sterling Products Corporation to appear specially, but not generally, as aforesaid.

Respectfully submitted,

JOHN H. BRUNINGA,

Appearing specially, but not generally, as aforesaid, on behalf of Sterling Products Corporation.

St. Louis, Missouri,
November 5, 1931.

Service of the above acknowledged, and copy accepted this 9th day of November, 1931.

WM. C. McCOY,
Solicitor for Plaintiffs.

EVANS & McCOY
PATENT LAWYERS
Bulkley Building
Cleveland

May 17, 1930.

Sterling Products Corporation,
2916 North Market Street,
St. Louis, Mo.

Gentlemen:

You are advised that pistons that you are now offering to the trade infringe the following patents that are owned by The Cleveland Trust Company of Cleveland, Ohio:

		Issued
Mooers-Spillman	Pat. No. 1,092,870	4/14/14
Franquist	" No. 1,153,902	9/21/15
Howdeshell	" No. Re-16,273	2/23/26
(Original)	" No. 1,473,233	9/ 6/23
Mooers	" No. 1,402,309	1/ 3/22
Maynard	" No. 1,655,968	1/10/28

It is our understanding that you have heretofore considered these patents in connection with your business activities and therefore are familiar with them.

The Cleveland Trust Company has authorized us to say on their behalf that, unless you cease infringement and account for past damages and profits, suit will be brought forthwith.

Yours very truly,

EVANS & McCOY.

WCM/LR

November 24, 1930.

Evans & McCoy,
Bulkley Building,
Cleveland, Ohio.

Gentlemen:

I have been informed by my client, Sterling Products Corporation, that you have been writing my client's customers in various parts of the United States, not only calling their attention to the fact that pistons purchased by them from Sterling Products Corporation and offered by those customers to the trade, infringe the various patents of the Cleveland Trust Company, for which you brought suit against The Simmons Manufacturing Company, of which you sent me a copy of the bill of complaint, but also threatening those customers that unless they cease offering those Sterling pistons for sale and even account for damages and profits, suit will be brought forthwith against those customers. My client has given me the originals of a number of these letters, and they are all to the above effect.

Now, I do not want to advise you as to the legal situation created by the above proceeding, nor tell you what liabilities your client is incurring; for you, no doubt, have made up your own mind as to that. I, however, will say that in my opinion this action in behalf of your client constitutes unfair competition in trade, for which my client will hold your client strictly accountable. In my opinion, this matter has gone way beyond what is permitted by the well considered decisions of the courts in the various Circuits; for your client has not instituted suit directly against Sterling Products Corporation, and is apparently afraid to do so. It is true you attempted to join my client in the Cleveland suit with The Simmons Manufacturing Company; however, that Court has no jurisdiction of Sterling Products Corporation, and my client was never served, and the Marshal's return shows that Sterling Products Corporation was not, and could not be, served in the Cleveland District.

My client stands ready to defend any suit which you may want to institute against Sterling Products Corporation in the United States District Court for the Eastern Division of the Eastern Judicial District of Missouri, sitting at St. Louis, Missouri. My client will not, however, tolerate this continual intimidation of customers, and even suits brought against customers. I, therefore,

would like to know as speedily as possible what the intentions of you and your client are with reference to this situation. Do you intend to simply intimidate customers and bring suits against customers, or do you intend to sue my client where you can get service on my client? Please let me hear from you by not later than November 28, 1930.

Very truly yours,

J. H. BRUNINGA.

JHB:HB

EVANS & McCOY
PATENT LAWYERS
Bulkley Building
Cleveland

October 9, 1931.

Chicago Auto Parts,
3053 Lawrence Ave.,
Chicago, Ill.

Gentlemen:

Sometime ago we wrote you a letter advising you that, in our opinion, the split skirt pistons which you were buying from Sterling Products Corporation and selling were, or would be when completed, an infringement of each of the following patents, and advising you that we would institute suits against you if you did not discontinue such infringement:

Spillman & Mooers	1,092,870
Mooers	1,402,309
Franquist	1,153,902
Schmiedeknecht	1,256,265
Howdeshell	Re-16,273
Maynard	1,655,968
Jardine	1,763,523
Gulick	1,815,733

We think we ought at this time to advise you that we instituted suit under these patents against The Simmons Manufacturing Company here in Cleveland last October for the sale of such pistons. Sterling Products Corporation was also named as a defendant. On September 25, 1931, The Simmons Manufacturing Company consented to the entry of a decree holding the said patents valid and infringed, and such decree was entered on

that date. An injunction has accordingly been issued against The Simmons Manufacturing Company enjoining that company from further selling such pistons and further infringing any of these patents during the life thereof, and ordering them to account to the owners of the patents for profits made by them on the pistons, damages incurred by the owners as a result of the infringement, and costs of the suit. We would be very glad to send you a copy of this decree and of this injunction if you are interested enough in it to wish copies.

We were advised that Sterling Products Corporation refused to furnish a bond to The Simmons Manufacturing Company and to contest the suit on the merits in behalf of The Simmons Manufacturing Company. If you wish affirmance of our advice or further particulars, you may think it wise to communicate with The Simmons Manufacturing Company, 3405 Perkins Avenue, Cleveland, Ohio.

We are writing you this information in the hope that you will not infringe these patents so that litigation may be avoided or limited.

Very truly yours,

EVANS & McCOY.

WCM/LR

EVANS & McCOY
PATENT LAWYERS
Bulkley Building
Cleveland

October 10, 1931.

Automotive Supply Co. Inc.,
128 N. Appleton St.,
Appleton, Wisc.

Gentlemen:

Your frank letter of September 16, 1931 is appreciated.

In accordance with your request we advise you that suit was instituted against The Simmons Manufacturing Company in Cleveland in September, 1930, for the sale of pistons supplied to them by Sterling Products Corporation, and Sterling Products Corporation was also made a party defendant in this suit. This suit was first set for hearing in June, 1931 and this setting was then changed to September 28, 1931.

On, September 25, 1931, The Simmons Manufacturing Company consented to the entry of a decree holding the said patents valid and infringed, and such decree was entered against The Simmons Manufacturing Company, enjoining that Company from further selling such pistons or further infringing any of these patents during the life thereof, and ordering them to account to the owners of the patents for profits made by them on the pistons, damages incurred by us as a result of the infringement and costs of the suit. We would be very glad to send you a copy of this decree and of this injunction if you are interested enough in it to wish copies.

We were advised that Sterling Products Corporation refused to furnish a bond to The Simmons Manufacturing Company and to contest the suit on the merits in behalf of The Simmons Manufacturing Company. If you wish affirmance of our advice or further particulars, you may think it wise to communicate with The Simmons Manufacturing Company, 3405 Perkins Avenue, Cleveland, Ohio.

We are writing you this information in the hope that you will not infringe these patents so that litigation may be avoided or limited.

Yours very truly,

EVANS & McCOY.

WCM: W

ORDER GRANTING PETITION OF JOHN H. BRUNINGA FOR LEAVE TO ENTER SPECIAL APPEARANCE OF STERLING PRODUCTS CORPORATION—TO OBJECT TO JURISDICTION.

(Entered December 30, 1931 by Paul Jones, Judge.)

[Case No. 4045.]

This day this cause came on to be heard on the petition of John H. Bruninga for leave to enter his special appearance, in order to enter a special appearance on behalf of Sterling Products Corporation, for the sole and only purpose of objecting to the jurisdiction, and was submitted to the Court; on consideration thereof the Court granted leave.

ANSWER OF DEFENDANT, THE SCHRIBER-SCHROTH COMPANY, TO BILL OF COMPLAINT.

(Filed February 1, 1932.)

[Case No. 4045.]

Now comes defendant, The Schriber-Schroth Company, and for its Answer to the Bill of Complaint says:

1.

Answering Paragraph 1 of the Bill, defendant admits the existence, organization and place of business of The Cleveland Trust Company, but denies the status of Chrysler Corporation as alleged.

2.

Answering Paragraph 2 of the Bill, defendant admits its incorporation and place of business as alleged, but having no knowledge as to the organization and place of business of Sterling Products Corporation, denies the allegations with respect thereto.

3.

Answering Paragraph 3 of the Bill, defendant denies the jurisdiction of this Court as to the subject matter alleged and relief prayed.

4.

Answering Paragraph 4 of the Bill, defendant admits that on June 2, 1917 one Louis P. Mooers filed an application, Serial No. 172,380, but denies that said application disclosed the subject matter of patent No. 1,402,309, and further denies that the Statutory prerequisites had been complied with as alleged.

5.

Answering Paragraph 5 of the Bill, defendant has no knowledge save said allegations as to the various alleged assignments, and therefore, denies the same, and further denies that The Cleveland Trust Company became vested with and holds the entire right, title and interest in and to said patent No. 1,402,309.

6.

Answering Paragraph 6 of the Bill, defendant admits that on July 14, 1917 one Victor E. Schmiedeknecht

filed an application, Serial No. 180,511, and that on February 12, 1918 patent No. 1,256,265 issued to said Schmiedeknecht, but denies that said application disclosed the subject matter of patent No. 1,256,265, and further denies that the Statutory prerequisites had been complied with as alleged.

7.

Answering Paragraph 7 of the Bill, defendant has no knowledge save the allegations as to the assignment and guarantee to Frank Kent as alleged, and therefore, denies the same.

8.

Answering Paragraph 8 of the Bill, defendant has no knowledge save the allegations as to the alleged assignment by Frank Kent to Bohn Aluminum & Brass Corporation as alleged, and, therefore, denies the same.

9.

Answering Paragraph 9 of the Bill, defendant has no knowledge save the allegations as to the assignment by Bohn Aluminum & Brass Corporation to The Cleveland Trust Company as alleged, and, therefore, denies the same; and defendant denies that The Cleveland Trust Company became vested with and now holds the entire right, title and interest in and to said patent No. 1,256,265.

10.

Answering Paragraph 10 of the Bill, defendant admits that on January 3, 1921 one Howard E. Maynard filed an application, Serial No. 434,467, but denies that said application disclosed the subject matter of patent No. 1,655,968; and further denies that the Statutory prerequisites had been complied with as alleged.

11.

Answering Paragraph 11 of the Bill, defendant admits the issue of patent No. 1,655,968 on January 10, 1928, jointly to Chrysler Corporation and Aluminum Company of America, but denies proper issuance of said patent to said alleged patentees, and denies that there was thereby secured to said Chrysler Corporation and Aluminum Company of America the sole and exclusive right to make, use and sell to others to be used through-

out the United States and the territories thereof, any alleged invention or improvement described in said patent.

12.

Answering Paragraph 12 of the Bill, defendant has no knowledge save the allegations as to the assignment by Aluminum Company of America to The Cleveland Trust Company as alleged, and, therefore, denies the same; and further denies sufficient title by The Cleveland Trust Company of said patent to warrant institution of suit for infringement thereof by The Cleveland Trust Company.

13.

Answering Paragraph 13 of the Bill, defendant has no knowledge save the allegations as to whether Chrysler Corporation is a non-resident, residing without the jurisdiction of this Court and cannot be made a co-defendant; as to whether The Cleveland Trust Company has advised Chrysler Corporation of the imminent pendency of this case and of the obligation of Chrysler Corporation to join voluntarily in the bringing of this suit; as to whether Chrysler Corporation has refused or declined to voluntarily join as alleged; defendant, therefore, denies such allegations. Defendant further denies that The Cleveland Trust Company is without remedy on the Maynard patent unless Chrysler Corporation is joined as a co-plaintiff in this cause, and further denies that Chrysler Corporation is made a plaintiff in this cause instituted in this District without its consent in order to prevent a failure of justice and to enable The Cleveland Trust Company to protect its interest herein.

14.

Answering Paragraph 14 of the Bill, defendant admits that on March 11, 1920 one Frank Jardine filed an application, Serial No. 364,997, but denies that said application disclosed the subject matter of patent No. 1,763,523, and further denies that the Statutory prerequisites had been complied with as alleged. Defendant admits issue of patent No. 1,763,523 on June 10, 1930 to The Cleveland Trust Company as Trustee, but defendant has no knowledge as to the mesne assignments alleged, and therefore, denies the same; defendant further denies that The Cleveland Trust Company has the sole and exclusive right to make, use and sell to others to be used throughout the United States and the territories

thereof, any alleged invention or improvement disclosed in said patent.

15.

Answering Paragraph 15 of the Bill, defendant admits that on November 30, 1917 one Edward J. Gulick filed an application, Serial No. 204,661, but denies that said application disclosed the subject matter of patent No. 1,815,733, and further denies that the Statutory prerequisites had been complied with as alleged. Defendant admits that patent No. 1,815,733 issued on June 21, 1931 to The Cleveland Trust Company, but denies that thereby there was granted to said The Cleveland Trust Company the sole and exclusive right to make, use and sell to others to be used throughout the United States, its territories and dependencies, any alleged invention or improvement disclosed in said patent.

16.

Answering Paragraph 16 of the Bill, defendant has no knowledge save the allegations as to any alleged assignment by said Gulick to Packard Motor Car Company, and, therefore, denies the same.

17.

Answering Paragraph 17 of the Bill, defendant has no knowledge save the allegations as to any alleged assignments by Packard Motor Car Company to The Cleveland Trust Company, and, therefore, denies the same.

18.

Answering Paragraph 18 of the Bill, defendant denies recognition and acquiescence in and by the public of the validity of any or all of the aforesaid patents; denies special recognition and acquiescence in and by parties who have discontinued infringement thereof and who have made amends to plaintiff; denies licenses, payment of material royalties, manufacture and sale of pistons under any or all of said patents by licensees, and extensive and successful use of such pistons. Defendant denies that any licensees under said patents have built plants and established organizations for the manufacture and sale of such pistons on the strength of and by reason of their confidence in the patents in suit; but on the contrary, defendant states that as alleged The Cleveland

Trust Company is a mere title holder, holding the patents in suit for the benefit of a limited number of piston manufacturers as *cestuis qui trustent* or beneficiaries under agreements and declarations of trust including Aluminum Company of America, Bohn Aluminum & Brass Corporation, United States Aluminum Company and Aluminum Industries Corporation; that such *cestuis qui trustent* or beneficiaries are in turn licensees under the patents in suit; and that the entire arrangement is one to restrain competition in trade, to fix prices and to create a monopoly in the manufacture and sale of pistons.

19.

Answering Paragraph 19 of the Bill, defendant admits notification by plaintiff, The Cleveland Trust Company, of the patents in suit and of said The Cleveland Trust Company's contention that a certain piston, like Plaintiffs' Exhibit 1 submitted with plaintiffs' Bill of Particulars, infringe said patents in suit, but defendant denies that it has infringed or continued to infringe any or all of said patents.

20.

Answering Paragraph 20 of the Bill, defendant admits that since the issue of all of said patents, and prior to the filing of the Bill herein defendant has sold in this District pistons like Plaintiffs' Exhibit 1, submitted with plaintiffs' Bill of Particulars, and further admits that the slot in the skirt of said piston is intended to be completed to the top and bottom of the skirt prior to installation in an engine. Defendant further admits that it has purchased such pistons from Sterling Products Corporation, a Missouri corporation, having its place of business at St. Louis, Missouri, and beyond the jurisdiction of this Court, by orders placed and filled in St. Louis, Missouri, and shipped from St. Louis, Missouri, by said Sterling Products Corporation. Defendant denies that defendant and Sterling Products Corporation have jointly and severally infringed any or all of the patents in suit or contributed to the infringement thereof by making and/or causing to be made, or by using and/or causing to be used, or by selling and/or causing to be sold in this District or elsewhere, Pistons for Internal Combustion Engines embodying jointly and severally any or all of the inventions of the patents in suit. Defendant further denies that it has realized or received any gains and

profits or has inflicted on plaintiff any damage on account of any sale or marketing of pistons, and defendant further denies that it intends to infringe any of the patents in suit or to induce others to venture to infringe. Defendant states that The Cleveland Trust Company, as alleged, is a mere title holder, does not manufacture or market pistons, and that the sale and marketing of pistons by defendant has not inflicted on The Cleveland Trust Company any loss or damage.

21.

Answering Paragraph 21 of the Bill, defendant is not informed, save by the allegations as to the institution of a suit against The Simmons Manufacturing Company and Sterling Products Corporation, as to the entry of a consent decree against The Simmons Manufacturing Company, and as to an injunction against The Simmons Manufacturing Company, and, therefore, denies the same.

22.

Answering Paragraph 22 of the Bill, defendant denies that plaintiffs, and particularly The Cleveland Trust Company are without adequate or sufficient remedy at law and that The Cleveland Trust Company was warranted to institute this suit and is entitled to maintain the same in a Court of Equity but alleges that this suit has been instituted in order to harass defendant because defendant is a customer of Sterling Products Corporation, a Missouri corporation, which corporation is a non-resident and beyond the jurisdiction of this Court. That this suit is one of a series of suits which have been instituted in this District against customers of said Sterling Products Corporation, said other suits being respectively, Equity Nos. 4046 and 4047, in each of which suits Sterling Products Corporation has been named as a party defendant with said customer, and in each of which suits the piston relied upon as being an infringement is the same piston as relied upon herein; that defendant is informed, and, therefore, avers that Sterling Products Corporation has invited plaintiff, The Cleveland Trust Company, to institute a suit for infringement of the patents in suit at St. Louis, Missouri, the place of residence of said Sterling Products Corporation, but that plaintiff, The Cleveland Trust Company, has neglected to do so; and that said Sterling Products Corporation is

financially able to respond in profits and damages in case said patents be sustained and infringement thereof found.

23.

Further answering Paragraph 13 of the Bill, defendant alleges that as to the Maynard patent 1,655,968, this suit can not be maintained by The Cleveland Trust Company because Chrysler Corporation is a necessary and even indispensable party because, as alleged, said Chrysler Corporation is a joint owner of an undivided one-half interest in the entire right, title and interest in and to said patent; that said Chrysler Corporation does not appear as a party plaintiff, nor as a party defendant and cannot be made a party plaintiff as alleged because it is beyond the jurisdiction of this Court; and that this suit should, therefore, be dismissed as to the Maynard patent No. 1,655,968.

24.

Further answering, defendant alleges that the causes of action joined in the Bill of Complaint as to the several patents are not joint, because as alleged, the titles of the Mooers patent No. 1,402,309, the Schmiedeknecht patent No. 1,256,265, and of the Gulick patent No. 1,815,-733 are in The Cleveland Trust Company; the title of the Jardine patent No. 1,763,523 is in The Cleveland Trust Company as Trustee; and the title of the Maynard patent No. 1,655,968 is jointly in Chrysler Corporation and The Cleveland Trust Company; and that the Bill of Complaint should, therefore, be dismissed as to the Jardine and Maynard patents.

25.

Further answering, defendant avers that the subject matter of each of the Letters Patent in suit, especially when expanded to include the pistons used and sold by defendant, does not constitute patentable subject matter under the law, and that each of said Letters Patent is void for want of invention.

26.

Further answering, defendant avers that the subject matter of each of the Letters Patent in suit, and every substantial and material part thereof, did not exhibit or

embody any substantial variation or change from what belonged to the state of the art as it existed at the time of the alleged inventions or discoveries by the respective applicants, and did not involve the exercise of the inventive faculty or constitute the subject matter of invention proper to be secured by the grant of Letters Patent within the meaning and intent of the Statutes of the United States relating to the grant of patents for inventions and that said patents are accordingly void.

27.

Further answering, defendant avers that said Mooers, Schmiedeknecht, Maynard, Jardine and Gulick, surreptitiously or unjustly obtained Letters Patent for things which were in fact the inventions of others who were using reasonable diligence in adapting and perfecting the same, and that each of said Letters Patent is accordingly void.

28.

Further answering, defendant avers that for the purpose of deceiving the public, the description and specification filed by said Mooers, Schmiedeknecht, Maynard, Jardine and Gulick, were made to contain less than the whole truth relative to their alleged inventions or discoveries, or more than was necessary to produce the desired effect, and that each of said Letters Patent is accordingly void.

29.

Further answering, defendant avers that the description of the alleged invention in the specification of each of said Letters Patent in suit is not in such full, clear, concise and exact terms as to enable any person skilled in the art or science to which it appertains or with which it is most closely connected to make, construct, use or employ the same, and that each of said Letters Patent is accordingly void.

30.

Further answering, defendant avers that each of said Letters Patent in suit does not comply with Section 4888 of the Revised Statutes of the United States, in that it does not particularly point out and distinctly claim the part, improvement or combination which the patentee

claims as his invention or discovery, and that each of said Letters Patent is accordingly void.

31.

Further answering, defendant avers that the claims in said Letters Patent in suit, and each of them, are directed to functions and results and do not claim subject matter of invention proper to be secured by the grant of Letters Patent within the meaning and intent of the Statutes of the United States relating to the grant of patents, and that each of said Letters Patent is accordingly void.

32.

Further answering, defendant avers that the patentees Mooers, Schmiedeknecht, Maynard, Jardine and Gulick, claimed in said Letters Patent in suit to be the original and first inventors or discoverers of material or substantial parts of the things patented, of which they were not the original and first inventors or discoverers; that no disclaimers have been entered to such material or substantial parts, and that plaintiff should, therefore, not be allowed to maintain its suit for infringement of any of said Letters Patent against this defendant.

33.

Further answering, defendant avers that during the prosecution of each of the applications of each of the patents in suit, the claims thereof were limited and restricted in the light of the prior art cited by the Examiner and on account of rejections by the Examiner; that the claims must be limited and restricted in the light of the prior art, and that defendant does not infringe any of said Letters Patent or any claims of any of said Letters Patent when so limited and restricted.

34.

Further answering, defendant avers that the patents in suit, and each of them, were and are wholly invalid and void because the alleged inventions, improvements or discoveries purported to be patented thereby and every substantial and material part of each patent was published, described or patented prior to the alleged invention or discovery thereof, by the respective applicants, or more than two years prior to their applications for said patent, in and by the following Letters Patent, the applications therefor, and the following publications:

AS TO THE MOOERS PATENT 1,402,309.

Name	*Number*	*Date*
United States		
Spillman & Mooers	1,092,870	April 14, 1914
Riedler	1,259,292	March 12, 1918
Vincent	1,279,184	Sept. 17, 1918
Marmon	1,293,846	Feb. 11, 1919
Franquist	1,153,902	Sept. 21, 1915
Spillman	1,229,540	June 12, 1917
Allyne	1,329,820	Feb. 3, 1920
Church	1,327,147	Jany. 6, 1920
Bamberg	1,329,821	Feb. 3, 1920
French		
Chenard & Walcker	468,595	Apr. 28, 1914

AS TO SCHMIEDEKNECHT PATENT 1,256,265.

Name	*Number*	*Date*
United States		
Spillman & Mooers	1,092,870	April 14, 1914
British		
Ferry	12,772	May 25, 1914
Pugh	17,256	July 27, 1907
Ricardo	17,953	Dec. 23, 1915

AS TO THE MAYNARD PATENT 1,655,968.

Name	*Number*	*Date*
United States		
Spillman & Mooers	1,092,870	April 14, 1914
Long	1,395,441	Nov. 21, 1921
Schmiedeknecht	1,256,265	Feb. 12, 1918
Ebbs	700,309	May 20, 1902
Ricardo	1,294,833	Feb. 18, 1919
French		
Chenard-Walcker	468,595	April 28, 1914
British		
Ricardo	17,953	Dec. 23, 1915

AS TO THE JARDINE PATENT 1,763,523.

Name	*Number*	*Date*
United States		
Ricardo	1,294,833	Feb. 18, 1919
Franquist	1,153,902	Sept. 21, 1915
Ebbs	700,309	May 20, 1902
Long	1,395,441	Nov. 21, 1921
Mooers	1,402,309	Jan. 3, 1922
Anderson	1,283,021	Aug. 29, 1918
Barthel	1,139,396	May 11, 1915
French		
Chenard-Walcket	468,595	April 28, 1914

AS TO THE GULICK PATENT 1,815,733.

Name	*Number*	*Date*
United States		
Spillman & Mooers	1,092,870	April 14, 1914
Ebbs	700,309	May 20, 1902
Franquist	1,153,902	Sept. 21, 1915
Vincent	1,279,184	Sept. 17, 1917
Van Bever	1,031,212	July 2, 1912
Knight	1,061,756	May 13, 1913
Allyne	1,329,820	Feb. 3, 1920
Bamberg	1,329,821	Feb. 3, 1920
British		
Rainforth	6,826	Mar. 19, 1912
Pugh	17,256	July 27, 1907
Ferry	12,772	May 25, 1914
French		
Chenard-Walcker	468,595	April 28, 1914

and in and by certain other Letters Patent, not now known to defendant, but which when ascertained, defendant prays may be made part of this Answer by amendment thereto.

35.

Answering further, defendant avers that said Mooers, Schmiedeknecht, Maynard, Jardine and Gulick pat-

ents, and each of them, were and are wholly invalid and void, because more than two years prior to the effective filing dates of the applications for the respective patents, the alleged inventions, improvements and discoveries purported to be patented in each of them, or any substantial or material part thereof, were publicly used or on sale in this country by the following persons and corporations at and residing at the following places:

George Dorris	St. Louis, Missouri
Dorris Motor Car Co.	St. Louis, Missouri
Elmer Long	Detroit, Michigan and Quincy, Illinois and Hannibal, Missouri
Packard Motor Car Company	Detroit, Michigan
Edward J. Gulick	Elkhart, Indiana and Detroit, Michigan
H. H. Franklin Mfg. Company	Syracuse, N. Y.
Aluminum Castings Company	Cleveland, Ohio

and by certain other parties not now known to the defendant, but whose names when ascertained, defendant prays may be made part of this Answer by amendment thereto.

36.

Further answering, defendant avers that said Mooers, Schmiedeknecht, Maynard, Jardine and Gulick patents and each of them, were and are wholly invalid and void, because said Mooers, Schmiedeknecht, Maynard, Jardine and Gulick were not the original and first inventors or discoverers of the alleged inventions, improvements or discoveries purported to be patented therein, or any substantial or material part thereof, but that the same, and every substantial and material part thereof were, prior to the alleged inventions thereof by said Mooers, Schmiedeknecht, Maynard, Jardine and Gulick developed or known and used by others in this country at and residing at the following places:

George Dorris	St. Louis, Missouri
Elmer Long	Detroit, Michigan and Quincy, Illinois and Hannibal, Missouri
E. O. Spillman	No. Tonawanda, N. Y.
Carl R. Green	Dayton, Ohio
Jesse G. Vincent	Detroit, Michigan
Howard G. Marmon	Indianapolis, Indiana
Charles Y. Knight	Chicago, Illinois
Charles C. Anderson	Cedar Rapids, Iowa
Gustave E. Franquist	New Brunswick, N. J.
Edmund E. Allyne	Cleveland, Ohio
Joseph H. Bamberg	Tonawanda, N. Y.

and by certain other persons and corporations not now known to defendant, but whose names, when ascertained, defendant prays may be made part of this Answer by amendment thereto.

37

Further answering, defendant avers that said Mooers, Schmiedeknecht, Maynard, Jardine and Gulick patents, and each of them were and are wholly invalid and void, because said Mooers, Schmiedeknecht, Maynard, Jardine and Gulick, were not the original and first inventors or discoverers of the alleged inventions, improvements, or discoveries purported to be patented therein, or any substantial or material part thereof, but that the same and every substantial and material part of each patent, was prior to said alleged invention thereof by said Mooers, Schmiedeknecht, Maynard, Jardine and Gulick conceived by others in this country, who were using reasonable diligence in adapting and perfecting the same, to-wit, by the following persons residing at the following places:

George Dorris	St. Louis, Missouri
Elmer Long	Detroit, Michigan and Quincy, Illinois and Hannibal, Missouri
E. O. Spillman	North Tonawanda, N. Y.
Carl R. Green	Dayton, Ohio
Jesse G. Vincent	Detroit, Michigan

Howard G. Marmon	Indianapolis, Indiana
Charles Y. Knight	Chicago, Illinois
Charles C. Anderson	Cedar Rapids, Iowa
Gustave E. Franquist	New Brunswick, N. J.
Harold D. Church	Detroit, Michigan

and by certain other persons and corporations not now known to defendant, but whose names, when ascertained, defendant prays may be made part of this Answer by amendment thereto.

38.

Further answering, defendant avers that patents Nos. 1,402,309, 1,655,968, 1,763,523 and 1,815,733, and each of them were and are wholly invalid and void, because:

(a) The alleged improvements purported to be claimed in patents Nos. 1,655,968, 1,763,523, and 1,402,309 are so inter-related and so described and claimed in the respective patents that the subject matter thereof is doubly patented.

(b) The alleged improvements purported to be described and claimed in patents Nos. 1,655,968 and 1,815,733 are so inter-related and so described and claimed in the respective patents that the subject matter thereof is doubly patented.

39.

Further answering, defendant avers that said Mooers, Schmiedeknecht, Maynard, Jardine and Gulick patents in suit are wholly invalid and void because the alleged inventions, improvements, or discoveries purported to be claimed therein are substantially different from any indicated, suggested or described in the original applications therefor; that subsequent to the filing of the applications for said Letters Patent, plaintiff and its predecessors in title became aware of the rights of others in and to the manufacture, use or sale of pistons not within the scope of said original applications; and that thereafter said applications were enlarged and expanded for the purpose of dominating the intervening rights of others.

40.

Further answering, defendant avers that said Mooers, Schmiedeknecht, Maynard, Jardine and Gulick

patents in suit were and are wholly invalid and void because the alleged inventions, improvements, or discoveries purported to be claimed therein are substantially different from any indicated, suggested or described in the original applications therefor; that subsequent to the filing of the applications of said Letters Patent, and after pistons were in public use or on sale in this country or available to the public in this country, plaintiff and its predecessors in title enlarged and expanded said applications with a view of dominating the intervening rights of others.

41.

Further answering, defendant avers that said Gulick patent in suit is wholly invalid and void, because said Edward J. Gulick did, after his alleged invention or discovery of the thing purported to be patented thereby, so unreasonably delay to make application for Letters Patent that the alleged invention, improvement or discovery, and every substantial or material part thereof was constructively abandoned to the public.

42.

Further answering, defendant avers that plaintiff, The Cleveland Trust Company, has from time to time acquired and accumulated Letters Patent, and applications therefor, purporting to claim certain alleged inventions, improvements or discoveries, which within the knowledge of plaintiff, The Cleveland Trust Company, had been invented or known or used by others prior to the alleged inventions or discoveries thereof by the patentees or applicants; that plaintiff, The Cleveland Trust Company, has unjustly intimidated the public with such Letters Patent, known by it to be wholly invalid and void, and that plaintiff, The Cleveland Trust Company, should, therefore, be denied the equitable relief prayed for in the Bill.

Wherefore, Defendant prays to be hence dismissed, and for its costs in this behalf most wrongfully sustained.

The Schreiber-Schroth Company,
By Kwis, Hudson & Kent,
Solicitors for Defendant.

Service of a copy of the foregoing answer acknowledged this 1st day of February, 1932.

EVANS & MCCOY,
Solicitors for Plaintiffs.

NOTICE BY DEFENDANT, THE SCHRIBER-SCHROTH COMPANY OF INTENTION TO TAKE DEPOSITIONS.

(Filed February 15, 1932.)

[Case No. 4045.]

The Defendant hereby gives notice of its intention to take depositions in the above entitled cause, pursuant to the provisions of Equity Rule 47 and Sections 863, 865, 866 and 867 of the Revised Statutes of the United States.

THE SCHRIBER-SCHROTH COMPANY,
By KWIS, HUDSON & KENT,
Solicitors.

Cleveland, Ohio
February 15, 1932.

Service of a copy of the foregoing notice is acknowledged this 15th day of February, 1932.

EVANS & MCCOY,
Solicitors for Plaintiffs.

SUPPLEMENTAL NOTICE BY DEFENDANT, THE SCHRIBER-SCHROTH COMPANY, OF INTENTION TO TAKE DEPOSITIONS, ATTACHED TO VENNER ET AL. DEPOSITIONS.

(Filed January 9, 1933.)

[Case No. 4045.]

To Messrs. Evans & McCoy,
Bulkley Building,
Cleveland, Ohio,
Attorneys for Plaintiffs:

Please take notice that on Wednesday, April 27, 1932, at 10:00 A. M., Central Standard Time, the depositions of Charles Chadwick, a resident of Quincy, Illinois, William M. Venner and George Dorris, residents of St. Louis, Missouri, will be taken on behalf of the defendant herein, before Mildred Cook, a Notary Public, who is not of counsel for either of the parties to nor interested in this cause, at 2119 Railway Exchange Building, St. Louis, Missouri.

Upon the completion of the depositions of said witnesses, the deposition of Sidney D. Royalty, a resident of Jacksonville, Illinois, will be taken in Room No. 1, Morrison Block, Jacksonville, Illinois, before Lina Epperson, a Notary Public, who is not of counsel for either of the parties to nor interested in this cause. The exact time for taking the deposition of said Sidney D. Royalty will be fixed upon the completion of the depositions of the three first named witnesses.

The examination of said witnesses will be taken under Sections 639, 640 and 641 of Title 28 of the United States Code.

KWIS, HUDSON & KENT,
Attorneys for Defendant.

Cleveland, Ohio
April 22, 1932.

Service of a copy of the foregoing Notice of Taking Depositions is hereby acknowledged this 22nd day of April, 1932.

EVANS & McCOY,
Attorneys for Plaintiffs.

NOTICE.

To Messrs. Evans & McCoy,
Bulkley Building,
Cleveland, Ohio,
Attorneys for Plaintiffs:

Supplementing the notice, dated April 22d, 1932, of taking depositions in St. Louis, Missouri and Jacksonville, Illinois, please take notice that, in addition to the witnesses whose depositions will be taken, at 2119 Railway Exchange Building, St. Louis, Missouri, pursuant to said notice, the deposition of Louis M. Stellman of Syracuse, New York, will be taken at said address following the depositions of the witnesses Chadwick, Venner and Dorris and before proceeding to Jacksonville, Illinois, for the purpose of taking the deposition of the witness Royalty.

KWIS, HUDSON & KENT,
Attorneys for Defendant.

Cleveland, Ohio
April 26, 1932.

Service of a copy of the foregoing Notice is hereby acknowledged this 26th day of April, 1932.

EVANS & McCOY,
Attorneys for Plaintiffs.

ORDER FOR REFERENCE TO AND APPOINTMENT OF SPECIAL MASTER.

(Entered November 7, 1932 by Paul Jones, Judge.)

[Case No. 4045.]

This cause coming on to be heard upon motion and application of Plaintiffs to refer the issues, both of law and fact, to a Special Master for his investigation, consideration, findings, conclusions and report, and it appearing that exceptional conditions exist in this cause

and in the business of the Court, and it appearing that this cause is at issue, and that counsel for both parties have heretofore stipulated that the cause may be tried at any time after June 20th, 1932, at the convenience of the Court, and it appearing that the cause will take considerable time for the trial thereof, therefore:

It is ordered that this cause, with its pleadings, evidence, proofs and exhibits, including the testimony, exhibits and all other matter heretofore filed, taken, submitted, offered or adduced, be, and the same is hereby referred to Wm. B. Woods, Esq., Special Master, to hear witnesses and counsel, to receive and consider testimony, affidavits, exhibits and other proofs including that heretofore filed, to examine and consider pleadings, proofs, briefs, arguments and any and all other matters relating to the questions involved or the issues raised in this cause, and rule on the admissibility of evidence, but to preserve such evidence as counsel may demand which the Special Master deems inadmissible, together with his ruling thereon for ultimate and final ruling by this Court, to observe such tests and experiments as the parties may perform or cause to be performed, and as he, with reasonable convenience, is able to and considers proper, and to hold his sessions within the District and Division of this Court at such times as he shall direct and thus to hear and consider all of the proofs and arguments pertinent to the issues of law and fact arising in this cause; and

It is further ordered that the said Special Master herein shall file and report to the Court his conclusions of law and findings of fact, together with all the evidence and exhibits presented, offered and/or considered by him and to file with this Court his report and opinion, giving his reasons and authority for his findings and conclusions, along with his recommendations concerning the relief demanded and/or concerning the final disposition of this cause, all subject to the final, ultimate and full review and determination by this Court. Exceptions to defendant.

JONES,
United States District Judge.

Service of a copy of the foregoing Motion and proposed Order and the Memorandum attached thereto acknowledged this 14th day of September, 1932.

KWIS, HUDSON & KENT,
Solicitors for Defendant.

STIPULATION OF PLAINTIFF AND DEFENDANT, THE SCHRIBER-SCHROTH COMPANY, CONSOLIDATING CAUSE NO. 4045 WITH CAUSES NOS. 4046 AND 4047 FOR TRIAL.

(Filed January 11, 1933.)

[Case No. 4045.]

It is hereby stipulated and agreed as follows, by and between the parties hereto:

1. That the above-entitled case may be tried with both of the following cases:

The Cleveland Trust Company, Chrysler Corporation, vs. The Aberdeen Motor Company.	Equity No. 4046.
The Cleveland Trust Company, Chrysler Corporation, vs. The F. E. Rowe Sales Company.	Equity No. 4047.

2. That the evidence adduced in any one of the three above-mentioned cases, whether a deposition, exhibit, or any other form of evidence, may be used in either or both of the other above-mentioned cases with the same effect as if adduced therein.

3. That each party furnish to the other party, a copy of all depositions and photostatic copies of all paper exhibits taken and offered by it, without expense to the other party to whom such depositions and copies of the depositions are furnished, but that said copies and photostats which are so furnished are not to be made part of the taxable cost in this cause. This Section 3 does not apply, however, to the records in interference cases in which any of the applications on which any of the patents in suit issued were involved.

4. That the Exhibits referred to in the depositions may be retained in the custody of counsel first producing such exhibits, subject to the inspection of opposing counsel upon request and reasonable notice, said exhibits to be preserved in the same condition as when so referred to and to be produced in Court on or before the day of the hearing.

5. That each party may introduce uncertified printed or photostatic copies of any United States or foreign patent and of any publication, copies of United States Patent Office records, including file wrappers and contents and records of interferences in the Patent Office, with the same force and effect as if the originals or duly certified copies thereof were used, and subject, however, to the right of either party to show by proper proof any inaccuracies either in the dates or otherwise which may appear on said copies by comparison of the original documents with such copies or otherwise; all subject to any objection except that the copies are not the original or certified.

EVANS & MCCOY,
Counsel for Plaintiffs.

KWIS, HUDSON & KENT,
Counsel for Defendant.

St. Louis, Missouri,
April 27, 1932.

It is so Ordered.

JONES, *U. S. D. J.*

ORDER GRANTING STIPULATION CONSOLIDATING EQUITY CAUSE NO. 4045 WITH CAUSES NOS. 4046 AND 4047 FOR TRIAL, ETC.

(Entered January 11, 1933 by Paul Jones, Judge.)

[Case No. 4045.]

Pursuant to stipulation filed herein it is ordered:

1. That the above case be tried with Equity cases No. 4046 and No. 4047.

2. That the evidence adduced in any one of the three above-mentioned cases, whether a deposition, exhibit, or any other form of evidence, may be used in

either or both of the other above-mentioned cases with the same effect as if adduced therein.

3. That each party furnish to the other party, a copy of all depositions and photostatic copies of all paper exhibits taken and offered by it, without expense to the other party to whom such depositions and copies of the depositions are furnished, but that said copies and photostats which are so furnished are not to be made part of the taxable cost in this cause. This Section 3 does not apply, however, to the records in interference cases in which any of the applications on which any of the patents in suit issued were involved.

4. That the Exhibits referred to in the depositions may be retained in the custody of counsel first producing such exhibits, subject to the inspection of opposing counsel upon request and reasonable notice, said exhibits to be preserved in the same condition as when so referred to and to be produced in Court on or before the day of the hearing.

5. That each party may introduce uncertified printed or photostatic copies of any United States or foreign patent and of any publication, copies of United States Patent Office records, including file wrappers and contents and records of interferences in the Patent Office, with the same force and effect as if the originals or duly certified copies thereof were used, and subject, however, to the right of either party to show by proper proof any inaccuracies either in the dates or otherwise which may appear on said copies by comparison of the original documents with such copies or otherwise; all subject to any objection except that the copies are not the original or certified.

AMENDMENT TO ANSWER OF DEFENDANT, THE SCHRIBER-SCHROTH COMPANY.

(Filed April 19, 1933.)

[Case No. 4045.]

Leave having been granted by the Master, the Answer in the above-entitled cause is hereby amended as follows:

Add the following paragraphs:—

43.

Further answering, defendant avers that the Gulick patent in suit 1,815,733 is wholly invalid and void as to claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 38, 42 and 43, because the alleged invention, improvement or discovery purported to be patented thereby and every substantial and material part thereof

A. Was published, described or patented prior to the alleged invention or discovery thereof or more than two years prior to the application for said patent, by the following Letters Patent and the application therefor:

Schoengarth 1,174,092, patented March 17, 1916, on application filed October 1, 1915.

B. Because more than two years prior to the effective filing date of the Gulick patent, the same was publicly used or on sale in this country by the following person, at and residing at the following place:

Walter L. Schoengarth, Ironwood, Mich. Ironwood, Mich.

C. Because prior to the alleged invention thereof by said Gulick, the same was developed or known or used by the following person in this country and residing at the following place:

Walter L. Schoengarth, Ironwood, Mich.

D. Because prior to said alleged invention thereof by said Gulick, the same was conceived by another in this country who was using reasonable diligence in adapting and perfecting the same, namely by the following person at and residing at the following place:

Walter L. Schoengarth, Ironwood, Mich. Ironwood, Mich.

THE SCHRIBER-SCHROTH COMPANY,
By KWIS, HUDSON & KENT,
Solicitors for Defendant.

Cleveland, Ohio,

STIPULATION OF PLAINTIFF AND DEFENDANT, THE SCHRIBER-SCHROTH COMPANY, RE NARRATIVE OF TRANSCRIPT.

(Filed October 26, 1934.)

[Case No. 4045.]

It is hereby stipulated by and between the respective parties to the above cases by their counsel as follows:

That the Plaintiffs need not file separate narrative forms of the evidence in each of the above entitled cases, but that it will be sufficient to file a narrative form in one cause and a reference thereto in each of the other two causes.

WM. C. McCOY,
Counsel for Plaintiffs.

KWIS, HUDSON & KENT,
Counsel for Defendants.

It is so ordered.

JONES, *United States District Judge.*

Cleveland, Ohio,
October 26, 1934.

ORDER GRANTING STIPULATION OF PLAINTIFF AND DEFENDANT, THE SCHRIBER-SCHROTH COMPANY, FOR FILING NARRATIVE FORM TESTIMONY IN ONE CAUSE WITH REFERENCE THERETO IN EACH OF OTHER TWO CAUSES.

(Entered October 26, 1934 by Paul Jones, Judge.)

[Cases Nos. 4045-6-7.]

Pursuant to stipulation filed herein, it is ordered that the plaintiffs need not file separate narrative forms of the evidence in cases Nos. 4045, 4046 and 4047, but that it will be sufficient to file a narrative form in one cause and a reference thereto in each of the other two causes.

ORDER APPROVING NARRATIVE FORM OF TESTIMONY.

(Entered February 26, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

Now comes the plaintiffs and present to the Court their certain narrative form of testimony taken at the trial of this cause which being found by the Court to be true, is allowed, signed and sealed, and is hereby ordered to be filed in this cause.

ACKNOWLEDGMENT OF SERVICE OF NARRATIVE FORM OF TESTIMONY.

(Filed February 26, 1935.)

[Case No. 4045.]

Service of a copy of the within Narrative Form of Testimony in the above entitled suits, on appeal, acknowledged this 21st day of February, 1935, and the Narrative is hereby approved by Defendants.

JOHN H. BRUNINGA,
Attorney for Defendants.

NARRATIVE FORM OF TESTIMONY.

(Filed February 26, 1935.)

It was agreed between counsel that the exhibits would be marked as offered in Cleveland Trust Co. and Chrysler Corporation vs. Aberdeen, in Equity 4046.

By Mr. Richey: I offer the patents in suit as Plaintiffs' Exhibits 2 to 6, inclusive.

I will offer in evidence as Plaintiffs' Exhibit 1, the piston referred to in the Answer.

A very large number of claims have been infringed, and we have picked out certain claims upon which we rely. In the Gulick patent we charge infringement by the piston which we have called the Sterling piston, and an example of which is in Exhibit 1, claims 1, 11, 12, 13, 15, 18, 30, 33, 35, 38, 41, 42, and 43.

Now, we charge infringement by the Ray Day piston of claims 1, 15, 22, 27, 28, 29, 30, 33, 36, 37, 38, 42, and 43.

Of the Jardine patent, we charge infringement by the Sterling piston, exemplified by Exhibit 1, when the slit is completed of claims 1, 2, 4, 5, 6, 7, 8, 9, 10, and 11.

We charge infringement by the Ray Day piston of claim 1.

In the Maynard patent, we charge infringement by the Sterling piston of claims 1 to 11, inclusive, that is, all of the claims of that patent.

Of the Mooers patent, we charge infringement by the Sterling of claims 1, 2, 6, and 10. We had notified you of claim 9, but we are dropping that out.

By the Ray-Day piston we charge infringement of claims 3, 4, 8, and 11 of the Mooers patent.

Of the Schmiedeknecht patent, we charge infringement by the Sterling of claims 1 and 3.

PLAINTIFF'S TESTIMONY.

W. F. Burrer, a witness called by Plaintiffs, being first duly sworn, testified as follows:

Direct Examination by Mr. McCoy.

I am W. F. Burrer, aged 45, President, Treasurer and General Manager of Aberdeen Motor Supply Company, residing at 3558 Antisdale Avenue, Cleveland Heights, Ohio.

Q. I hand you a piston marked Plaintiffs' Exhibit 1 and ask you whether or not you sell pistons identically the same as this piston except with the longitudinal slot in the thrust face completed at the top and bottom.

Mr. Bruninga: I am willing to agree to that. I have told Mr. McCoy we agreed to that.

Mr. McCoy: And will you agree, Mr. Bruninga, that this defendant, the Aberdeen Motor Supply Company, sold pistons with the slots completed, between the date of issue of the patents in suit and the filing of the bill of complaint?

Mr. Bruninga: Yes.

Mr. McCoy: Will you also agree that the paper marked Plaintiffs' Exhibit 7 is a true and correct copy of an instruction sheet that is given to the purchaser of the pistons like Plaintiffs' Exhibit 1 in suit?

Mr. Bruninga: Yes. And I agree to that as to all of these three defendants, if that is all.

Mr. McCoy: The instruction sheet is offered in evidence as Plaintiffs' Exhibit 7.

The Master: It may be received.

(Narrative continued) Plaintiffs' Exhibit 8 piston is known to the trade as a Ray Day piston. We sell

pistons like Plaintiffs' Exhibit 8 with the longitudinal slot in the thrust face of the piston completed, and we sell pistons identically the same except that the slot is uncompleted.

Mr. McCoy: Plaintiffs' Exhibits 8 and 9 are offered in evidence as Exhibits with the marking by which they are identified.

The Master: They may be received.

Ray Day pistons like Plaintiffs' Exhibits 8 and 9 had been sold by Aberdeen Motor Supply Company for about two years, and these Ray Day pistons like Exhibits 8 and 9 were sold continuously after we started to handle such pistons.

The witness is handed the advertisement Plaintiffs' Exhibit 10A.

Mr. McCoy: Will you admit that advertisements represented by Plaintiffs' Exhibit 10A have been circulated to the trade by one or more of these defendants?

Mr. Bruninga: I don't know whether by one or more of these defendants. I say that one has been in circulation somewhere.

A poster like Plaintiffs' Exhibit 12 is prominently displayed in the Aberdeen Motor Supply Company's place of business.

Mr. McCoy: The poster is offered in evidence as Plaintiffs' Exhibit 12.

The Master: It may be received.

Cross Examination by Mr. Bruninga.

It was not until February or March of 1932 that Aberdeen Motor Supply Company started selling Ray Day pistons like Exhibits 8 and 9.

I have given verbal instructions to complete the split in pistons like Plaintiffs' Exhibit 9. I sold a piston something like the strut type piston, Defendant's Exhibit AAA. Aberdeen Motor Supply Company sales were to independent repair shops, car dealers, car distributors, including trucks, and Aberdeen Motor Supply Company pushes the sale of Ray Day pistons like Exhibits 8 and 9, more than other pistons.

(Examination closed.)

CLARENCE A. SCHROTH, a witness called by Plaintiffs, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

I am Clarence A. Schroth, age 41, Vice President and General Manager of The Schriber-Schroth Company, residing at 2250 Fourth Street, Cuyahoga Falls, Ohio.

CROSS EXAMINATION by Mr. Bruninga.

This company sold pistons like Exhibit 1 to garages and repair shops and it discontinued selling such pistons after this suit was started against ..

(Examination closed.)

F. E. ROWE, a witness called by Plaintiffs, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. Richey.

My name is F. E. Rowe. I am of mature age, and am president and treasurer of F. E. Rowe Sales Company. I live at 45 South Walsh, Akron, Ohio.

My company sold pistons like Plaintiffs' Exhibit 1, and finished the pistons themselves by cutting the longitudinal slot through them. The F. E. Rowe Sales Company also sold pistons like Plaintiffs' Exhibit 9, and when such pistons were ready to leave the shop, the longitudinal slots were cut through like Exhibit 8. Ray Day pistons like Exhibits 8 and 9 have been sold by my company continuously for about three years.

CROSS EXAMINATION by Mr. Bruninga.

The F. E. Rowe Sales Company sells to garages, fleet owners, and manufacturing concerns, and have outside men to take orders for pistons, and they particularly stress the sale of Ray Day pistons but do not stress the sale of Sterling pistons. The sale of Sterling pistons is a price proposition and we have always been able to buy Sterling pistons cheaper than any other piston that they handled or might have handled. Within the last thirty days I think Ray Day has met the Sterling price.

Besides Sterling pistons, like Exhibit 1, my company also sells Sterling pistons like Defendants' Exhibit BBB, for 6-cylinder Chevrolet cars, and have sold such pistons continuously for about 2½ years. These pistons were brought from Sterling Products Corporation.

Mr. Bruninga: I offer in evidence Defendants' Exhibit BBB.

The longitudinal split in Exhibit BBB pistons is completed before the pistons leave The F. E. Rowe Sales Company. Sterling makes only Ford and Chevy sizes, as I understand it. We sell them both.

RE-CROSS EXAMINATION by Mr. Bruninga.

I cannot answer as to whether my company handled Exhibit BBB pistons before this suit was brought against my company.

By Mr. Bruninga: I agree that this particular defendant (F. E. Rowe Sales Company) of which the witness is an official furnishes the piston (Defendants' Exhibit BBB) with the skirt split all the way up and down.

By the Witness: We finish the split ourselves.

(Examination closed.)

CHARLES W. WHITNEY, called as a witness by Plaintiffs, who being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Charles W. Whitney; age 30; residence 3470 North Cliff Road, Cleveland Heights, Ohio. I am employed as a clerk by The Cleveland Trust Company, and have been so employed for nine and a half years. That is the plaintiff in this cause.

The Cleveland Trust Company receives royalties on a group of piston patents, and it receives such royalties on pistons.

Mr. Bruninga: I object to that, unless they are royalties on piston patents involved in this case.

The Master: I think that is a proper objection.

Mr. Richey: Well, we will connect it up, your Honor. We can't do everything with this witness.

The Master: As a preliminary question it may stand, then.

(Narrative continued) It receives royalties on just the one group of piston patents. I know this from the reports that we receive from the licensees. We receive

these reports from the Aluminum Company of America and Bohn Aluminum & Brass Corporation. These reports that we receive refer to the sub-licensee of Aluminum Company of America, the Aluminum Industries, Incorporated, of Cincinnati, Ohio. I know of former concerns that have paid royalties on pistons to The Cleveland Trust Company. They are Walker M. Levett Company, National Piston Company, I believe. There is the Kant Skore Company, which I now understand to be the Aluminum Industries, Incorporated, of Cincinnati.

The direct licensees report to us the number of pistons sold by them. These are the parties that I have named.

Mr. Bruninga: I would like to make an objection at this time that the best evidence is at least one of the reports.

(Narrative continued) I know this from the reports that we receive from the licensees that are under my control and supervision.

The Master:—The reports themselves are the best evidence.

Mr. Richey: We are willing to produce the reports for inspection of the other side, but we think for the convenience of the Court this witness can testify as to a certain summary he has taken from the report. We want to prove the number of pistons.

The Master: You may offer that statement and let counsel on the other side examine the original documents that you have. You can shorten this by putting in the tabulation, can't you?

Mr. McCoy: Yes.

(Narrative continued) I have, at your request, examined these reports, and can tell the total number of pistons on which royalties have been paid to The Cleveland Trust Company. I have such a tabulation with me. (Witness produces same.) This report covers the period from 1924 to the present time, including the three-quarters of 1932. From this report, the total number of pistons on which royalties have been paid to The Cleveland Trust Company during the period covered by the tabulation I have produced, is 90,397,709.

The royalties paid to The Cleveland Trust Company on these pistons is one cent per piston; the aggregate amount paid to The Cleveland Trust Company being $903,977.09.

The number of pistons on which royalties have been paid by years, is as follows: 1924, 2,335,308; 1925, 5,775,392; 1926, 5,128,482; 1927, 5,824,029; 1928, 20,981,043; 1929, 20,786,112; 1930, 14,198,296; 1931, 9,321,967; and three-quarters of 1932, 6,047,080.

Mr. McCoy: The tabulation produced by the witness is marked Plaintiffs' Exhibit 13 and is offered in evidence.

Mr. Bruninga: I must object to that unless we have a chance to inspect these royalty reports.

Mr. Richey: All right, when do you want to see them?

The Master: This will be received subject to the objection that defendants' counsel now makes, and received subject to correction later if there are any changes or observations he wishes to make after examination.

Mr. Bruninga: Second, that there has been no licenses produced at all to show what patents are covered by these royalties. This is put in for the purpose of showing commercial use, possibly acquiescence, and we are entitled to see the license, to see what they really amount to.

Mr. Richey: Well, you are not entitled to see the licenses. You are entitled to proof to show that the pistons that were made by these licenses on which these royalties were paid were such pistons as are involved or come within these patents, and you are entitled to see these reports, and we will be glad to show them to you. We didn't bring them down here because there are so many of them.

Mr. Bruninga: I believe I am entitled to see the licenses.

Mr. Richey: We haven't testified to the contents of the licenses.

The Master: How is anyone to know these pistons are made subject to any contract?

Mr. Richey: The licenses don't show that. We have to put an expert on.

The Master: The report don't show it, either.

Mr. Richey: I know, but we are going to put on a man to show these are the pistons under which the royalties were paid.

The Master: If that is connected up it is competent later.

Mr. Richey: We are going to connect it up. We have a man who knows the pistons and we have a man who is an accountant.

The Master: It will be received subject to the objection at this time.

Mr. Bruninga: I understand, subject to my objection, I am entitled to see the licenses, not take somebody else's word for it, and that these are royalties paid under the patents and not for something else.

The Master: I will not pass on that subject whether you are entitled to see the licenses at this time. If before we close the case it is apparent they are needed, I will rule on that subject.

Mr. Richey: Direct examination closed.

CROSS EXAMINATION by Mr. Bruninga.

These reports come to me.

I work under R. A. Malm, Vice President in charge. Mr. Perfler is an assistant trust officer in the same department that I am in. I believe he is familiar with the trust estate. He doesn't have charge of it; he is under Mr. Malm. He is accountable to Mr. Malm, as I understand it. Mr. Malm is senior officer. Mr. Malm has charge of the department. Mr. Perfler and myself, of course, would be under him, as I understand it. I am under Mr. Malm. Both Mr. Malm and Mr. Perfler are in town. They will be here for a couple of days.

Mr. Bruninga: Will counsel produce them if I want them later on?

Mr. Richey: Why, no, I can't guarantee to produce them. You can subpoena them.

Mr. Bruninga: That is all I want to know, if you can produce them or if I would have to subpoena them.

Thereupon, the plaintiffs called as a witness, ZAY JEFFRIES, who, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. Richey.

Q. Will you state your name, Doctor? A. Zay Jeffries.

Q. Do you live in Cleveland? A. Yes, in Shaker Heights.

Q. And you are of mature age? A. Yes.

Q. Will you state how you are employed at the present time? A. I am consulting metallurgist for the Aluminum Company of America, with offices at the Harvard Avenue plant in Cleveland; chairman of the Technical Committee of the Incandescent Lamp Department of the General Electric Company, with an office at Nela Park, in Cleveland; and president of the Carboloy Company, a subsidiary company of General Electric Company.

Q. How do you divide your time among those companies? A. Well, I give approximately half my time to the Aluminum Company and half to the General Electric Company.

Q. Now, will you state your experience and your education and other qualifications in connection, particularly in connection with the subject matter to which this suit relates, naming any awards you have had in connection with societies related to the subject matter? A. I received the degree of Bachelor of Science in mining engineering, and later the degree of metallurgical engineer, and still later the honorary degree of Doctor of Engineering from the South Dakota School of Mines. I have also received the Degree of Doctor of Science, majoring in metallurgy from Harvard University. I taught metallurgy at Case School of Applied Science in Cleveland from 1911 to 1917. During that time I did considerable consulting work on various metallurgical and engineering problems for the National Electric Lamp Association, which is part of the General Electric Company, for the Lincoln Electric Company, and Aluminum Castings Company. My work with the Aluminum Castings Company began in 1915, and that connection has continued ever since, in one form or another. The Aluminum Castings Company was reorganized after 1915 and became Aluminum Manufactures, Incorporated, and then Aluminum Manufactures, Incorporated, became part of the United States Aluminum Company, at a still later date. I left the teaching work entirely in 1917 to give all of my time to the consulting and engineering work with the two companies, the Aluminum Castings Company and General Electric Company. At that time I assumed the directorship of research for Aluminum Castings Company. I was also director of research for Aluminum Manufactures, Incorporated. The research laboratories of Aluminum Manufactures, Incorporated,

were consolidated with the research laboratories of Aluminum Company of America, so at that time I joined the Aluminum Company of America staff. That was, as I recall it, in 1920.

In connection with my work with the Aluminum Castings Company and its successor company, and Aluminum Company of America, I have had considerable to do with the aluminum piston art, not only from the standpoint of manufacture but also from the standpoint of the testing of such pistons. The so-called dynamics laboratory at Harvard Avenue was for a time under my direction, and for years I have been in fairly close touch with the piston tests in that laboratory.

With reference to professional societies, I am a member of ten or more of the national engineering and scientific societies, having been president of the American Society for Steel Treating, and chairman of the Institute of Metals, Division of the American Institute of Mining and Metallurgical Engineers. I am a member of the Society of Automotive Engineers, and have been a member of the Non-Ferrous Metals Division of that society for perhaps 12 or 14 years. I have been chairman of the division for about five years during that period. I have also been on the executive committee of the American Society for Testing Materials. I am also a member of the Materials Committee for Aircraft of the National Advisory Committee of Aeronautics, and a member of the sub-committee on metals of that committee. Insofar as honors are concerned, I delivered a number of invitational lectures, such as the Robert Henry Thurston Lecture of the American Society of Mechanical Engineers; the Henry Marion Howe Lecture of the American Institute of Mining and Metallurgical Engineers; and the Campbell Lecture of the American Society for Steel Treating. I was also awarded the James Douglass gold metal by the American Institute of Mining and Metallurgical Engineers for distinguished service in non-ferrous metallurgy.

I have previously testified in a number of patent suits, including the ductile tungsten suit, the suits on the Langmuir gas filled lamp, the Just & Hanaman patent on tungsten as a filamentary body. I have testified for the Fulton Company on sylphon cases, and for the Aluminum Company of American in patent suits relating to the manufacture of aluminum alloy pistons.

Q. Will you describe briefly the construction and operation of an internal combustion engine, using this large drawing which I show you in your explanation, if you wish, and explain it with reference to a piston and its operation? You can put in any numerals on the drawing what you wish. The drawing I ask to be marked for identification as Plaintiffs' Exhibit 14.

I will just offer it in evidence as Plaintiffs' Exhibit 14 and you can refer to it by that number.

A. Exhibit 14 is a drawing showing a vertical section through an internal combustion engine of the water cooled type, the section being taken through the axis of one of the cylinder barrels. It is not a true sectional drawing inasmuch as the connecting rod is not sectioned but shown in vertical plan view. I will indicate by letter A a section of the combustion chamber. It is in this chamber that the mixture of heavy fuel is compressed and ignited and it is by virtue of the heat generated by ignition and the burning of the gas that the pressure in the combustion chamber becomes great and the piston is forced downward. The piston is shown in section and indicated as B. The other parts of the combustion chamber, with the exception of the valves, indicated by C, are stationary. The valves are stationary and closed at the time of the explosion so that at that time only the piston is movable. Therefore the entire force of the high gas pressure is available to move the piston, which in turn, by means of the connecting rod, D, transmits its motion by means of a crank E to the crankshaft, which in turn transmits its rotary motion by a gear system to the wheels of the automobile or to the propeller of a marine motor or other driving mechanism. The piston then has a reciprocating motion, that is, the downward movement is equivalent to twice the length of the crank arm. When the crank reaches its lowest position, the piston has traveled downward in the cylinder barrel as far as it can go. The cylinder barrel is indicated by F. The piston must perform many functions. First, it must take the blow of the explosion and be subjected to high pressure at the uppermost part, which is called the piston head, indicated by C, and at the same time be subjected to high temperature, so that the piston head must resist not only the mechanical force but also the temperature of the burning gases. It is essential that the force of the explosion be transmitted to the running gear of the car rather than expend itself by escaping from the chamber

through leaks. The piston therefore must also serve as a seal against the leakage of the gases from the combustion chamber into the lower part of the engine or the crank chamber. The piston must also act as a bearing. It is a moving part. During the explosion stroke, with considerable pressure at the head of the piston, the tendency is for the skirt of the piston, indicated by H, to be thrust strongly against one side of the cylinder barrel. That side depends on the direction of rotation of the crankshaft, and hence the direction of cocking of the connecting rod at any particular time. If the rotation is accomplished counter-clockwise, as shown on the present diagram, the tendency would be for the piston to be thrust hard against the right-hand side of the cylinder barrel. The piston must do all of these things at the same time and function even though different parts attain different temperatures. The direct heat of the explosion is applied at the head of the piston, so the head becomes the hottest portion. The bottom of the skirt is usually the coldest portion. In an ordinary piston the temperature usually decreases from the head towards the bottom of the skirt. The piston must not bear so hard in a cylinder as to consume too much power, and in any case it must not seize or stick. In the pleasure cars, and particularly during the last ten or twelve years, it must not make any noise, that is, it must not slap.

I think that covers in a brief way the function of the piston in the motor.

Q. Will you explain more carefully what you mean by sticking, scoring, slapping, oil pumping and clearance? A. There is one thing I neglected to mention, which was that the piston must also act as a seal against the transfer of oil in an upward direction from the cylinder into the combustion chamber, and that operation is known as oil pumping. It also must act as a seal against the dripping of any liquid gasoline or condensed moisture from the combustion chamber down into the crank chamber. The term "seizing" or "sticking" is applied to the condition of too tight a fit between the piston and the cylinder barrel. The motor parts are made of metal. When the cylinder barrel is made of cast iron, as is usual, and as has been used for many years, the expansion of the cylinder barrel is relatively small because the expansion of cast iron is relatively small. The expansion is still further retarded by the cooling effect of the water in the water jacket. The piston always

operates hotter than the cylinder. Therefore even when the piston itself is made of cast iron, as was usual in the earlier days, some clearance must be allowed in the fitting of the piston in the cylinder. The piston is therefore machined to a smaller diameter than the diameter of the barrel of the cylinder. That clearance varies in different parts of the piston; it was more near the head of the piston than in the skirt portion. It was more near the head because the head got hotter and expanded more. It was less in the skirt portion because the skirt portion remained cooler and expanded less. The amount of clearance required in the cast iron piston was quite small, being on the order of .001 inch per inch of diameter of the cylinder barrel. Thus a 3" diameter piston would be allowed a clearance of approximately .003". That clearance is in the skirt portion. The clearance near the piston head would be something on the order of .015", or sometimes more. A cast iron piston with such clearance will run in a cylinder, if properly lubricated and properly cooled without sticking or seizing, and without slapping. As the piston wears away or as the cylinder wears, the clearance may increase, and even a cast iron piston in a cast iron cylinder may make noise at some stage in the life of the motor. But, generally speaking, the question of fit is relatively simple when a cast iron piston is used in a cast iron cylinder.

About 1915 there came into use the aluminum alloy piston, and this material has about twice the coefficient of expansion as cast iron. The difficulties due to the excess of expansion of the piston over that of the cylinder barrel were tremendously multiplied. It was found practically impossible to fit an aluminum alloy piston in a cast iron cylinder so that it would not stick or seize when the motor became hot, and at the same time be free from the noise of piston slap when the motor was cold. The aluminum alloy, however, had two great advantages. It had a higher heat conductivity and therefore permitted the heat to escape from the piston head at a faster rate than in the iron piston; and it was also very light in weight, which was an advantage in a part which must reciprocate sometimes as much as 30 to 40 times, 50 or even as high as 60 or more times in one second, in extreme cases. So that in spite of the higher coefficient of expansion, there were aluminum pistons used at that time which were fitted with considerably greater clearance than the cast iron pistons. Generally speaking, approxi-

mately twice the clearance was required in the original fitting. Now, the greater clearance brought also another problem, that is, in addition to slapping. It also made it more difficult to seal the cylinder barrel against particularly the passage of oil from the downward direction up into the combustion chamber. The job is better done with small clearance than it is with large clearance.

Q. What is the relation between weight of aluminum alloy and iron? A. The aluminum alloy weighs, volume for volume, approximately 40% that of iron.

Q. And what is the relation between the coefficient of heat conductivity of the two metals? A. The aluminum alloy conducts heat about three times as well as cast iron.

Q. What is the effect of the reciprocation of a heavy piston in a pleasure automobile, say? A. The effect is to increase the so-called inertia forces, that is the forces due to the mass itself, at all of the bearings. That is, the piston must itself be started and that starting action is resisted by its weight. It also, when it reaches a high velocity, must be stopped, and that extra force of stopping is evident on the bearings, and in general that effect is to increase the vibration of the motor, so that the vibration becomes less as the piston becomes lighter.

Q. And what is the effect of low heat conductivity, such as that of iron? A. The effect is to cause the piston head to operate at a high temperature, which favors the accumulation of carbon deposit on the cylinder head and in the combustion chamber, and it also may promote the ignition of the charge before the spark plug is ready to cause that ignition.

Q. How long prior to the use of aluminum for pistons was it known that aluminum had these superior properties to iron which you have mentioned? A. Many years.

Q. Now, what if any efforts were made, commercially, that you know of to obviate or lessen the disadvantages of the iron piston which you have mentioned? A. Efforts have been made almost since the beginning of the automobile industry to reduce the weight of the cast iron piston or to otherwise obviate the difficulties due to the properties of cast iron. I don't know that a better brief recital of some of the attempts could be made than a number of the references.

Q. I won't ask you about the prior art, at least at this time. I had in mind what you knew commercially,

independently of the prior art patents. They will be taken up in rebuttal. A. Several schemes were used, such as making skeleton pistons in place of the full trunk skirt. Also it was suggested to use aluminum alloy head and cast iron skirt, thereby gaining the advantages of heat conductivity of aluminum for the head and the advantages of cast iron as regards its low thermal expansion for the skirt. Also rotary type engines were worked on to get rid of the reciprocation entirely. Also very thin walled castings were proposed and tried, and also pistons were made up, or attempts were made to solve those difficulties by pressing into shape very thin walled steel sheets, suitably braced on the inside.

Q. Did any of these efforts meet with success? A. None of them.

Q. You spoke of aluminum pistons coming in about 1915. How did they compare in structure with the iron piston such as shown on that Exhibit 14? A. They were of the same general type as the iron piston.

Q. That is the trunk type? A. Yes.

Q. Now, for what character of vehicles were they used? A. They were used in automobile engines and aircraft engines.

Q. What about the trucks? A. And trucks.

Q. To what extent, in a general way, were they adopted in automobile engines? A. They were used quite widely between 1915 and 1920 or 1921, that is, a considerable number of the original car manufacturers incorporated at one time or another aluminum pistons as a standard product.

Q. And you say they were objectionable for certain reasons? A. Yes, they were. They were objectionable for still another reason beyond what I have mentioned. The aluminum alloy did not have as good a bearing surface against the iron cylinder wall as the cast iron. That was especially true when the lubrication was bad or when the finish of the cylinder was bad. But the two main troubles at that time were sticking, seizing, if the pistons were fit too closely, and slapping if the pistons were fit too loosely.

Q. Now, what happens when a piston slaps? A. It is thrust against one side of the cylinder barrel and merely makes a noise in the motor.

Q. A big noise or little noise? A. Well, it is quite a little noise. To the driver of the car, at any rate, at the beginning it is not very noticeable, and to the auto-

motive engineer, he uses a stethoscope to discover such noises. But, nevertheless, as improvements have come along and standards have increased, the noiseless piston became a practical necessity. These noises were tolerated in the earlier days.

Q. And what happens when the piston sticks or scores in the cylinder? A. The least that can happen is to have the piston act as a brake on the motor and merely stop it, and after cooling off, if one is lucky, he may be able to start the motor again and drive away, but usually the piston or the cylinder, or both, are scored and sometimes the seizure takes place with such rapidity that the connecting rod is broken, or the piston is broken, and the motor is practically wrecked.

The Master: We will recess at this time until 9:30 tomorrow morning.

(Thereupon an adjournment was taken to the following day, whereupon, at 9:30 A. M., Thursday, January 19, 1933, the hearing was resumed.)

(Appearances the same as last noted.)

Mr. Bruninga: May it please the Court, the day before yesterday when the assignment papers were offered in evidence, I said I wanted to look over them and reserve objection. I am prepared to do that now, but I am just wondering whether it would not be well to wait until this witness gets through.

Mr. Richey: Or wait until Mr. McCoy gets here.

Q. Doctor, you talked yesterday about clearance. I will show you two drawings which I have marked for identification Plaintiffs' Exhibits 15 and 16. Would you explain what you mean by clearance on those drawings, putting the necessary reference numerals on them? A. Considering Exhibit 15, this is merely a cross-section of a cylinder wall and a piston wall inside of the cylinder wall. The cylinder and piston are indicated by the words "cylinder" and "piston"; and the word "clearance" also is printed on the exhibit. The piston in Exhibit 15 is shown concentric with the cylinder. The clearance would be then twice the distance between the outside of the piston wall and the inside of the cylinder wall. In the case of Exhibit 16, the clearance is shown greatly

magnified, and mostly on one side, that is the piston is in this exhibit supposed to be pressed fairly tightly against the cylinder wall on the right-hand side, so that the total clearance appears on the left-hand side. The clearance is the difference in diameter between the piston and the cylinder wall. It is not always possible to refer to it in such simple terms because of the out-of-roundness of pistons, boss reliefs, and so forth, but these drawings both very greatly magnify the actual clearance. The actual clearance on a three inch to four inch diameter piston is only in the neighborhood of two or three thousandths of an inch.

Mr. Richey: I offer those in evidence as Plaintiffs' Exhibits 15 and 16.

The Master: They will be received.

Q. Now, Doctor, to what extent have you been associated with this aluminum piston business since its inception, I mean in a business way with respect to the extent or lack of extent of use of these aluminum pistons? A. I first came in contact with the aluminum piston business in December, 1915, when I became associated in a consulting way with the Aluminum Castings Company of Cleveland. They were manufacturing aluminum alloy pistons in permanent molds in Buffalo. I went to Buffalo at that time to look at the piston process and at the molds, with the idea of assisting the Aluminum Castings Company in connection with the patent specifications in connection with the molds and processes. I later became associated with the Aluminum Castings Company in general research activities and I have been active continuously since December, 1915, with the Aluminum Castings Company, or its various successors, working on pistons. I have not only worked in connection with the factory in the manufacture of these pistons, in the laboratory on alloys and on physical characteristics of the metal in these pistons, but I have worked with the various automotive engineers in the United States on the adaptation of these aluminum pistons to the various motors, and I have also been familiar with the general aluminum piston business, especially as carried on by the Aluminum Company of America and its associated companies.

Q. Now, just what do you mean by "its associated companies"? A. Particularly the United States Aluminum Company, which is the manufacturing subsidiary of the Aluminum Company of America, and also it may be considered that Aluminum Industries, Incorporated, of

Cincinnati, may be associated with the Aluminum Company, in a way, inasmuch as they are manufacturing pistons under the same patent, and they also make pistons according to the same design.

Mr. Bruninga: I object to the witness' statement that the pistons manufactured by the United States Aluminum Company and the Aluminum Industries are made under these patents in suit. In the first place, that is a mere expression of opinion of this witness; in the second place, the licenses should be produced.

Mr. Richey: Of course we will go into the details of the patents in suit and these pistons after I have proved the pistons up, then I will have him discuss the patents and explain how they come under the patents.

The Court: That is a question that the Court is going to decide anyway, and it is also a question you may cross examine on as to statements made. I don't see there is anything I can do about it at this time.

Mr. Bruninga: The point Mr. Richey makes is aside from my objection. My objection is that when this witness says they are made under this patent, which presumes a license, that the licenses must be produced so that this court can determine whether they are made under the patent.

Mr. Richey: Well, the licenses don't show anything about that, whether they are made under the patent or not. A man may have a license and never manufacture under it.

The Master: If he claims the manufacture is made under it, I should think the license should probably be pertinent. We will meet that question when we come to it.

Q. You may proceed with your answer. A. I also had in mind the Aluminum Manufactures, Incorporated, which was the predecessor company of United States Aluminum Company insofar as piston manufacture is concerned, and the predecessor of Aluminum Company of America insofar as piston sales is concerned.

Q. I show you two pistons, one marked for identification Plaintiffs' Exhibit 17, and the other Defendants' Exhibit AAA, and ask you to state whether or not those are made commercially? A. Yes, they are.

Q. Who makes them commercially? A. United States Aluminum Company, Bohn Aluminum & Brass Corporation, Aluminum Industries, Incorporated, and insofar as Exhibit 17 is concerned, I think the Sterling Products Corporation.

Mr. Bruninga: Do you know that of your own personal knowledge, that Sterling Products Company makes pistons like Exhibit 17?

The Witness: I never saw them being made in the Sterling plant, no.

Mr. Bruninga: I object to that.

Mr. Richey: He knows it as a man who knows the piston business. Of course in proving commercial success you can't go and get the man who saw every one of them made. You have to rely on the man with general knowledge.

The Master: He states it as his belief. You may cross examine on that.

Q. Take this Exhibit 17, how long has that been manufactured by the United States Aluminum Company or its predecessors in business? A. I think about 11 or 12 years.

Q. And how long has it been manufactured by Aluminum Industries, Inc., or its predecessors? A. This particular type of piston I can't say. To the best of my knowledge, however, it is since 1923 or '24, at any rate.

Q. And how long have pistons like Exhibit 17 been manufactured by the Bohn Aluminum & Brass Corporation? A. To the best of my knowledge about the same period as the Aluminum Industries, Incorporated.

Q. Do you know if that piston was ever manufactured by anyone who has since discontinued its manufacture? A. I can't say from my own knowledge.

Q. You don't know about Levett? A. No, I don't recall whether Levett made this particular kind of piston or not.

Q. You do know the Levett Company is no longer in business? A. Yes, they are no longer in the piston business, at any rate.

Q. Take the other Exhibit, Defendants' Exhibit AAA, how long has that been manufactured by each of these companies I asked you about, that is, the Aluminum Company, the Bohn Company and the Aluminum Industries? A. I should say approximately five years by the Aluminum Company, perhaps six years by Bohn Aluminum & Brass Corporation, and I can't say just how

long by the Aluminum Industries, for several years past, at any rate.

Q. Now, with the exception of the companies that you have named, has anyone else manufactured pistons like Exhibit 17 and Defendants' Exhibit AAA, to any substantial extent, I mean, I don't mean a fellow that may have made a few? A. No, I think not.

Q. Now, to what extent have pistons like Exhibit 17 been manufactured and sold in this country? A. To a very large extent. Pistons similar to Exhibit 17 have represented one of the two types of aluminum alloy pistons which have been sold in the greatest numbers in the last 10 or 11 years in the United States.

Q. What is the other type? A. The other type is the one similar to Defendants' Exhibit AAA, known as the Invar strut piston. These two types of pistons generally represent most of the aluminum alloy piston business for pleasure cars in the United States.

Q. And pistons have been sold for manufacture and for replacement trade, haven't they? A. Yes.

Q. Now, what car manufacturers have used them in the original equipment? A. Taking for example Exhibit 17, Maxwell, Chrysler, Ford, Oakland, Overland, Hudson, Hup, Lincoln; those are the ones that come to my mind at the moment, for Exhibit 17. For Defendants' Exhibit AAA I may mention some of the same companies, Hup, Chevrolet, Studebaker, Packard, also Hudson and also Chrysler, Pierce-Arrow, Franklin, and Auburn. That is no attempt at a complete list, but they are representative.

Q. Is that all you can think of at the present time? A. I could think of some more later, Marmon, and the smaller ones, but those names I think will account for the largest percentage.

Q. Could you answer it in the other way, could you tell us the automobile manufacturers which have not used in original equipment pistons like Plaintiffs' Exhibit 17 and Defendants' Exhibit AAA over the last 10 or 12 years? A. I think the only ones are the General Motors cars, with exception of Oakland and Chevrolet, that is, I believe Cadillac, Olds, Buick and Pontiac have not used such pistons in original equipment.

Q. Chevrolet used them for a short time only? A. Yes.

Q. And Reo hasn't used them, has he? A. No, Reo hasn't used them, that is true. Reo is using aluminum pistons but of the trunk pattern.

Q. And when did Franklin adopt a piston like Exhibit AAA, do you know, as their standard equipment? A. I believe it was around 1926.

Q. You said those pistons had been made and used in enormous quantities. Can you give us any information more definitely as to what the quantities are that have been sold and used? A. Well, I think Mr. Whitney testified to ninety million.

Q. No, not what he testified, but what you know of your own knowledge? A. Well, I know of my own knowledge that millions of these pistons have been made and sold in the United States.

Q. By these companies that you named? A. Particularly, to my own knowledge, the Aluminum Company of America, and indirectly, Bohn, and Aluminum Industries.

Q. Will you state whether or not pistons like Exhibit AAA and Plaintiffs' Exhibit 17 have been used substantially exclusively by the automobile companies which you have mentioned, with the exception of the Chevrolet? A. Yes, with a very few exceptions, one of which I think of at the moment, I think Hupmobile used the Ray-Day type of piston for a while in orginal equipment.

Q. That is, by "Ray-Day type" you mean Plaintiffs' Exhibit 8? A. Yes, by the Ray-Day piston I mean one like Plaintiffs' Exhibit 8.

Q. You said something about certain concerns manufacturing and selling pistons like Exhibits AAA and 17. Now, with the exception of the Sterling and the Ray-Day, do you know whether or not those concerns have paid royalties for the use of those pistons? A. Yes, they have.

Q. Do you know whether or not with the exception of the Ray-Day and the Sterling there have been any manufacturers of those pistons like Exhibits 17 and AAA which have not paid royalties for their use? A. Not that I know of, with the possible exception of a couple of small companies on the west coast.

Q. Do you know if these royalties were paid under the patents in suit? A. That is my understanding, yes.

Mr. Bruninga: Same objection.

The Master: Same ruling.

Mr. Bruninga: I want to call attention to the fact that this line of testimony is not proper at this time. The first thing for this Court to consider is whether or not either of those pistons come within

the scope of the patent in suit. Because the purpose of it is to show, evidently to show pronounced commercial success, which doesn't come into play unless patentability is in doubt, or unless even the question of infringement is in doubt. I want to make the objection at this time.

The Master: Of course the testimony is competent before the case is closed. It may be out of order.

Mr. Bruninga: I just to make the objection at this time. It is within the discretion of the Court, I realize that.

The Master: Same ruling. You may proceed.

Q. Do you know whether or not it is recognized in the trade that the pistons like Plaintiffs' Exhibit 17 and Defendants' Exhibit AAA come within the patents in suit?

Mr. Bruninga: That is objected to, your Honor, as not within the purview of this witness.

Mr. Bruninga: I further want to make the objection that it calls for hearsay. The parties should be produced.

The Master: Of course any expert, what he testifies to is a good deal of it the result of hearsay and his own knowledge combined. I think I will overrule the objection; you may have your exception.

A. Yes, the automotive trade generally is aware of the existence of these patents, and such pistons are generally regarded to come within their scope.

Q. Doctor, have you studied the patents in suit so that you understand the devices illustrated and described therein, their operation, functions and uses? A. Yes.

Q. Now, will you take up each of the patents in suit separately and explain the constructions illustrated therein, their operation and what they do, and compare the disclosures of each of the patents in suit with the disclosures of the other patents in suit and point out the variations in structures, modes of operation, and the results of those structures and operations? A. Considering first the Gulick patent 1,815,733, there is described what purports to be a piston with a new construction. This construction consists essentially of a piston head, to which webs are attached and a skirt also attached to the webs, the said webs containing also the piston pin bosses. The skirt is detached from the head proper at

the top of the skirt by a horizontal slot, and the construction is such that if the skirt is slotted vertically or longitudinally the skirt will have flexibility. The common or trunk type of piston does not possess this type of flexibility. The skirt portion of a trunk type piston may reduce in diameter in one direction, but if so, the diameter in a direction at right angles to such direction is increased. This may be referred to as a distortion of the piston skirt. The Gulick construction provides for a true or real reduction in circumference of the piston by utilizing the slot to gain flexibility. In such a piston, if the diameter is reduced by pressure in one direction, there is not a corresponding expansion in a direction 90 degrees to such direction. The patent itself refers to the piston construction as having rigidity with respect to transmitting power or pressure from the combustion chamber to the mechanical parts of the motor, and flexibility with respect to the expansion forces of the metal of the piston to avoid seizing or sticking when the piston expands. This is mentioned in the first five lines of the patent on page 1. The construction of the head separated from the skirt by a horizontal slot and the longitudinal slot, for the purpose of avoiding seizure is also described in the second paragraph, lines 6 to 12 of the patent. The rigidly supported pin bosses are referred to in lines 16 to 22, as is also the yielding characteristics of the skirt in response to cylinder wall pressure. The operation is also referred to beginning line 76, page 1, where it is stated that the piston skirt is slotted so that it may not expand an undue amount when the piston is heated. In operation this structure behaves about as follows: the piston can be fitted into the cylinder barrel with relatively small clearance when both piston and cylinder are cold; that is, at room temperature. When the motor is started the first effect is for the piston head to be heated, gradually, as the motor heats up, equilibrium temperatures are established. The piston heats up to a temperature considerably above that of the cylinder wall, especially at and near the piston head. The piston is always hotter than the cylinder wall because heat must flow from the piston to the cylinder wall and heat only flows from a hotter body to a colder body. If the piston is made of aluminum, or aluminum alloy and the cylinder is made of cast iron, the metal of the piston will expand more than twice that of the cylinder wall. This assumes a coefficient of expansion of aluminum equal to twice that of

cast iron, and the temperature of the aluminum at least somewhat greater than that of the cast iron cylinder. Even an aluminum alloy piston of the trunk type, fitted with the same clearance as cast iron, would operate a short time when the motor is started. It would not be long, however, until the expansion of the piston would be sufficient to press against the cylinder wall so tightly that the piston would stick. There would, however, be no trouble from slapping or noise with such a fit. The motor would not be useful, however, because it could only be operated a few seconds or at most a few minutes before seizure occurred. If the aluminum alloy trunk type piston is given sufficient clearance so that it will not seize when the motor is hot, it makes a slapping noise or may make a slapping noise when the motor is cold, and also there is a tendency toward oil-pumping. In the Gulick construction the piston can be fit close enough at ordinary temperatures so that no slapping occurs when the motor is cold, and the yielding characteristics of the web and skirt may be taken advantage of to prevent seizure when the motor is hot. Thus the Gulick piston can be made of aluminum alloy and fitted closely, or fitted with small clearance in the piston at ordinary temperatures and will not seize at high or motor operating temperatures. The operation is one of the flexing of the skirt in response to cylinder wall pressure as required to avoid seizure. The Gulick construction may be referred to, in part at least, as a double walled structure and although the piston as shown has splendid yielding characteristics of webs and skirt, it is nevertheless an expensive construction to manufacture.

In the Jardine patent 1,763,523, there is gained in a large measure the flexing result of Gulick but a piston is provided having but a single wall, light in construction and economical in manufacture. In the Jardine piston the webs holding the bosses may do double duty as compared with the webs shown in the Gulick construction. This is particularly shown in Figs. 6 and 7 of the Jardine patent. Here the webs holding the bosses attach to the head flange at the bottom of the ring groove portion rather than to the head direct. This permits of a single wall construction. The skirt portion around the bosses is entirely removed in the construction shown in Figs. 6 and 7. Most of the bearing of the skirt is taken on what is known as thrust faces, which are the two faces 90 degrees from the wrist pin boss axis. The Jardine

construction is therefore simpler than the Gulick construction and provides a piston of lighter weight and one which is cheaper to manufacture. The skirt segments in Figs. 6 and 7 are separated from the head by horizontal slots. There is in effect a horizontal slot completely around the piston at the bottom of the ring flange. That is true in so far as contact with the cylinder is concerned. It is not true in so far as continuity of metal is concerned in the piston construction. The skirt is attached to the head by means of webs, which webs also carry the bosses. The thrust faces of the skirt may also be slotted vertically, or one of the faces may be slotted vertically to produce flexibility and yielding in response to cylinder wall pressure.

There are several ways of combating the clearance problem in the use of aluminum alloy pistons in cast iron cylinder barrels. One is the reduction of temperature of the skirt. This is present in Gulick to an extent by virtue of the horizontal slot at the bottom of the ring flange. It is also present to an extent in the Jardine piston inasmuch as the air gap at the horizontal slots, disconnecting the bearing faces from the head portion, is a heat insulator. This air gap does not permit the heat from the head to flow directly to the skirt at the bearing faces. The skirt is therefore maintained at a somewhat lower temperature than would obtain if the head and skirt were integrally connected horizontally. There is another way to help compensate for the excess expansion of the aluminum and that is by taking advantage of such distortion of the piston as may be produced by the differences in temperature of the different parts of the piston. The Jardine construction represents an example of this. When the piston head portion is heated to a high temperature, it expands more than the cooler skirt portion. Inasmuch as it is integrally connected to the skirt portion only in the region above the bosses, this entire head expansion tends to spread or increase the diameter of the piston in a direction parallel with the wrist pin boss.

We may refer to two varieties of expansion: one as thermal expansion. This is the normal expansion of the metal as the result of being heated to a certain temperature. The other is mechanical expansion. That is the expansion due to mechanical forces, no matter what the origin.

In this particular construction, as for example shown in Figs. 6 and 7 it will be found that the expansion of a

certain portion in a direction parallel with the wrist pin, at the top of the skirt portion, is greater than that which can be accounted for by temperature alone. This excess expansion may be called mechanical expansion and is clearly understood as being the result of the excess thermal expansion of the head portion. In a trunk type piston this mechanical expansion is imparted fairly uniformly to the top of the skirt. When the top of the skirt is slotted, as shown in Figs. 6 and 7 of the Jardine patent, this excess expansion occurs in a direction parallel with the wrist pin, and there is a contraction, there is a compensating contraction in a direction perpendicular to that of the wrist pin axis. This mechanical expansion can only be taken advantage of when the skirt around the bosses is relieved, allowing space for such metal to move freely. It may be noted that there is no such relief around the bosses in the Gulick patent. So the Jardine construction differs from Gulick in that respect, and the mode of operation differs also as described. The final result is, however, pretty much the same as Gulick in operation, with the exception of the lightness and cheapness of manufacture mentioned earlier.

Q. Will you explain why it is cheaper to manufacture? A. The Jardine piston, especially the one shown in Fig. 7, is cheaper to manufacture, in the first place because it contains less metal, and it is cheaper to manufacture, in the second place, because it is a much simpler construction. A single wall is always cheaper to manufacture than the double wall; and in this particular case there is another advantage that the Jardine piston can be cast in a permanent mold, and thus a better grade of metal can be gotten into the Jardine piston than into the Gulick piston.

Q. Suppose you explain briefly what you mean by permanent molds as distinguished from sand molds. A. Well, the permanent mold is made entirely of metal, almost entirely of iron and steel, and as many as fifty thousand pistons can be made in one mold. Each piston is like every other one, so there is great uniformity in size and in weight, and the chilling effect of the mold imparts hardness and resiliency to the metal in the piston, which is very desirable in these pistons which must have flexible skirts and webs.

Now, in the sand casting process the outside of the mold is made of sand and the inside is made of sand. There is just one casting made from one mold and the mold is broken into to get the casting out, and the core

is broken up and it is shaken out of the inside of the casting. The Gulick piston might be made with an iron outside and sand inside, but in any event it would be a more expensive piston to manufacture than the Jardine piston.

Now, considering the Maynard patent, 1,655,968, this patent as shown, has a construction a good deal like that of Jardine, shown in Jardine's Figs. 6 and 7, with the exception that the bottom of the skirt forms a complete bearing in the cylinder wall. This is a distinct improvement over the Jardine construction because it embodies the horizontal slot and the relieved bosses and the vertical slot for flexibility and adds an improved guide section below the bosses which not only assists in guiding the piston in the cylinder barrel, but also assists in reducing the pumping of oil. The construction is therefore different from Jardine in that respect, namely the addition of the full bearing at the bottom of the skirt, but the mode of operation is about the same, with the exception of the oil-pumping, and the result is about the same with the exception of the better bearing and oil-pumping, both of which are improvements over Jardine. The Maynard construction, as shown in the figures, has proved to be a very satisfactory one in commercial use.

Q. Now, before you pass from that Maynard patent, will you explain why it is possible to make the skirt complete at the bottom as against the top? A. The bottom of the skirt in the first place is not as hot as the top of the skirt, so that it does not require as much clearance as the top of the skirt. Furthermore, it is easier to provide flexibility at the bottom of the skirt than it is at the top of the skirt. The top of the skirt is both difficult to make flex and it is very hot. That is, the compensation for extra expansion at the top of the skirt must be greater than at the bottom of the skirt, due to the differences in temperature. And that extra compensation at the bottom of the skirt can be taken care of by the mechanical expansion and distortion, as mentioned in connection with Jardine, which requires relief around the bosses, whereas the greater ability to flex and the lower temperature permits a bearing around 360 degrees at the bottom of the skirt.

Q. They use in the patent the term "freezing." What does that mean? A. That means the same as sticking or seizing.

Q. Over in Fig. 1, the line where the web connects the skirt is shown inclined. Will you state what if any

importance there is to inclining it to the vertical? A. It is a part of the construction to have the line, to have the bearing shorter at the top of the skirt. Taking Plaintiffs' Exhibit 17, for example, and holding it with the head up, in the head up position, the line you refer to is, I take it, the one on which my pencil is now resting (indicating).

Q. Yes. A. The need for compensation due to excess expansion is a maximum on the skirt at the very top, and if that portion could be cut away entirely, the expansion problem would be best taken care of. It cannot be cut away entirely, however, and still have the piston function as it should as a bearing against the cylinder wall. The expansion difficulties are better taken care of by making that contact small, and that is accomplished best by increasing the bearing area as one progresses down the skirt from the top. That naturally produces the angularity of the line mentioned.

Q. Shown at F in Fig. 2 of the Maynard patent? A. Yes. Successful pistons of the Maynard type, however, have been made, sold, and used, in which the line F is vertical. A little greater initial clearance, however, is required with such a construction.

Q. You say that such pistons with that line made straight have been made, sold, and used. In what quantities and by whom? A. They have been made and sold by the Aluminum Company of America or its related companies, and they have been used by the Willys-Overland Company and the Oakland Company, merely to mention two.

Q. In what quantities? A. Considerable quantities; I can't say exactly.

Q. That is, hundreds or thousands of them? A. Oh, thousands of pistons.

Q. Now, will you proceed with the next patent?

(Short recess taken.)

A. Considering now the Moores United States patent 1,422,309, this is a piston which has no skirt flexibility. The piston consists of a head portion and a skirt attached to the head by means of a number of connectors extending from the bottom of the flange portion of the head to the top of the skirt. In the Moores piston there is a horizontal groove completely around the skirt at its top extending in some places entirely into the hollow structure of the inside of the piston, and in others ex-

tending merely into the metal of the connectors. It is stated that the invention contemplates the construction so that the piston can be readily made in permanent molds. By virtue of the horizontal slot, the piston skirt near the head does not become as hot as it would if the horizontal slot were absent. The reduction in skirt temperature should therefore help in reducing the amount of clearance required to prevent seizure. In the regions of the connectors, however, the heat from the head is transmitted directly to the top of the skirt, and hence these portions of the top of the skirt will become relatively hot. Relief is provided in the top portion of the skirt adjacent these connectors so as to permit the top of the skirt in these regions to expand freely. It may also be observed that the mechanical expansion will also be present in the Moocers piston, and the effect of it will be a maximum at the very point where relief is shown. This will permit the distortion of the piston at the top of the skirt to also partially compensate for the extra expansion of the aluminum. There is no relief at the bottom of the skirt portion and consequently full clearance must be provided at the bottom of the skirt. The construction is one which provides therefore, for reduction of skirt temperature and for distortion of the top of the skirt as a result of mechanical expansion, and relief at the proper places so that the mechanical expansion can be taken advantage of in the reduction of clearance. To put this a little more clearly, there is no skirt distortion until the piston has been heated. There is no need for compensation for the extra expansion until the piston has been heated, either. Thus the piston could be fit with less clearance in the cold than a trunk type piston and yet would not seize at the high temperatures. In as much, however, as this piston does not provide for flexibility of the skirt, it must be regarded as inferior to the constructions previously discussed, namely, Gulick, Jardine, and Maynard, in so far as ultimate results are concerned. It apparently in its present form cannot be fitted with sufficiently low clearance to satisfy the current demands for noiselessness. It does have, however, these important features of construction apparently necessary for the best operation.

Turning now to Schmiedeknecht patent 1,256,265, this specification refers specifically to a means of constructing a piston so as to reduce weight and yet retain rigidity and strength. It is primarily designed, accord-

ing to the specification itself, for the construction of a light weight cast iron piston. The same construction, however, or elements of construction, can be used to advantage in aluminum alloy for the purpose of gaining strength and rigidity in a light weight structure. The particular feature of the Schmiedeknecht construction which is stressed, is the web which connects with the boss near the inside and with the skirt at some distance from the boss. The skirt itself is removed around the bosses and below the bosses for some distance, so that there is an opening between the web and the bottom of the skirt, designated as 16 in Fig. 1. One of the known difficulties in connecting wrist pin bosses to a thin walled skirt is the insufficiency of the support of the boss and the weaving of the skirt portion during the operation of the piston. It was the object of the Schmiedeknecht patent to make light-walled structures and yet avoid this poor or insufficient boss support. The same construction or a similar construction has been found advantageous in the aluminum alloy piston.

Mr. Richey: I offer in evidence as Plaintiffs' Exhibit 17 the piston heretofore marked for identification as Plaintiffs' Exhibit 17, one of the commercial pistons of the plaintiffs' licensees.

Q. Will you now compare this piston, Plaintiffs' Exhibit 17, in construction, mode of operation, and results, with the pistons illustrated and described in each of the patents in suit? A. Comparing Plaintiffs' Exhibit 17 piston with the Maynard patent first, it is apparent that the piston is substantially identical to that shown in the drawings of the Maynard patent. It consists of the head portion with ring flange to which are attached two webs on opposite sides of the ring flange, the webs containing the wrist pin bosses and the webs being separated from the bottom of the skirt by openings below the bosses. It also has, in so far as contact with the cylinder is concerned, what amounts to a horizontal separation completely around the top of the skirt. It also has reduced bearing area of the skirt at the top and on the thrust faces, that is, faces at right angles to the axis of the wrist pin. It has the complete bearing for the cylinder wall at the bottom of the skirt, namely, below the bosses. The skirt bearing area is completely separated from the head by two horizontal perforations which penetrate into the hollow section of the interior of the piston. It has a so-called longitudinal slot which is even placed at a

slight angle with the vertical axis of the cylinder, or the piston, as shown in the drawings of the Maynard patent, Figs. 1 and 2. The sections of metal appear to be quite comparable to those shown in the drawings, and with my two hands I can produce visible and perceptible flexibility in the vertical slot, which shows that the piston operates the same as that shown in the Maynard patent. If properly fitted, I am certain that this piston will give the results of the Maynard patent.

Q. This piston, Exhibit 17, you mean? A. Yes.

Q. Well, you say "properly fitted." How is that piston fitted in use,—properly or improperly? A. This piston is given a small clearance in use, a clearance quite comparable with that used in the fitting of cast iron pistons of the trunk type in cast iron cylinders. Of course, any piston can be wrongly fitted in any cylinder, and under such circumstances it will not give proper results.

Q. Well, is it or is it not ordinarily fitted in the manner you speak of as being properly fitted? A. Oh, it is fitted properly. People know how to fit such pistons at the present time.

Q. Now, you said Exhibit 17 was substantially the same as the piston shown in the Maynard patent. What if any differences are there, and are those differences of any importance in operation and result? A. No, I can see no difference between Exhibit 17 and the disclosures in the drawings in the Maynard patent that would affect the operation.

Q. Or results? A. Or results.

Q. All right, now, will you proceed with the comparison of Exhibit 17 with the other patents in suit? A. In so far as the Jardine patent is concerned, this piston corresponds quite closely with the construction shown in Figs. 6 and 7 down to a point about opposite the lower portion of the bosses. It has the same head construction and the same web construction at the upper portion and the same general type of boss relief at the top of the skirt. It differs from the Jardine construction essentially in the completion of the bearing surface at the bottom of the skirt and the abbreviation of the web. The webs of the Maynard patent are made shorter, especially below the bosses. In so far as operation is concerned this piston will operate substantially the same as Jardine from the bosses upward, but it will provide a better bearing and better elimination of oil-pumping by virtue of the full bearing below the boss section. So the

result of the piston Exhibit 17 should on the whole be somewhat better than the result of the Jardine, specific Jardine construction shown in Figs. 6 and 7, although embodying the results of such Jardine piston about from the boss portion upwards. In so far as Gulick is concerned, the piston, Exhibit 17, differs in construction by being a single walled, lighter construction—a single walled construction thus producing a lighter piston than Gulick. It operates at the bottom of the skirt very much the same as Gulick. It operates at the top of the skirt differently from Gulick by virtue of the difference in construction. The top of the skirt in Gulick is quite flexible. It is sufficiently flexible to compensate for all of the extra clearance. The top of the skirt of the Maynard is not sufficiently flexible to compensate for all the difference in clearance. The other factors in Maynard are taken advantage of, such as the relief around the bosses and the mechanical distortion, enlarging the diameter across the bosses and pulling in the diameter at 90 degrees from the bosses. The compensation for the extra expansion is also partly provided for by reducing the bearing area at the top of the skirt on the thrust faces, which is not done in Gulick.

Q. Now, you have said that the Jardine piston operated differently from Gulick and the top of the skirt in Exhibit 17 operated differently from Gulick. Just what do you mean by saying they operate differently? A. I mean that the Jardine adds to Gulick the mechanical distortion and the boss relief and the reduction of bearing area at the top of the skirt in the cylinder. That portion is a different one from the operation of the Gulick construction as shown in the diagram. It adds in fact to the flexibility of Gulick the boss relief and mechanical distortion and reduction of area of the bearing contact.

Q. That is, it employs the Gulick operation but adds to it? A. That is true.

Q. And that same thing is true of the upper part of this Exhibit 17? A. Yes, exactly.

Q. But what is meant by the difference in operation was that they all employ the same operation, but the Jardine and the Exhibit 17 add something to it? A. Yes.

Mr. Bruninga: Objected to as leading.

Mr. Richey: I am just summarizing.

The Master: I think that should be sustained. He has already answered it; so there is not anything to it.

Mr. Richey: I am just summarizing. I think I may ask a leading question when I summarize. He may answer?

The Master: It may stand. The answer as given was "Yes."

Q. Will you proceed with your comparison of Exhibit 17 with the patents in suit? A. Exhibit 17 has what might be called these short connectors between the ring flange portion of the head and the skirt, as described by Mooers, in Mooers' patent. And the construction of this Exhibit 17 near the junction between the head portion and the skirt portion is somewhat like that described by Mooers. The operation at the top of the skirt is also, in part, similar to that described by Mooers, namely, the hottest portion is that which is directly connected with the head and adjacent portions of the skirt. These portions will become hotter and hence expand more than the portions of the skirt which are insulated from the head by the air gaps. This expansion will cause mechanical distortion, which is taken care of in one direction by relief and in the other direction by reduction in clearance. So far as that element is concerned, it is present in the Exhibit 17 as well as the flexibility feature described in Gulick.

With respect to the Schmiedeknecht patent, it can be noted that the boss construction of Exhibit 17 is generally similar to that of the Schmiedeknecht patent. The web in the Schmiedeknecht drawing attaches to the skirt near the inner part of the boss and to the head portion near the outer portion of the boss to a greater extent than is found in Exhibit 17. That is shown particularly in Fig. 5. On the other hand, the openings below the bosses in the skirt are substantially the same as in the Schmiedeknecht and there is the full bearing section at the bottom of the skirt. Schmiedeknecht however has no provision for flexibility nor for clearance compensation, and it was not intended in his construction by itself, because it was intended that this particular construction as he described it would be applied to cast iron.

Q. I now call your attention to Plaintiffs' Exhibit 1, the Sterling piston, and ask you to assume, first, that this vertical slot is cut through at the bottom and top so as to make it continuous from the bottom of the skirt to the top, that is, from the bottom to the horizontal slot, and compare such a piston with the piston Plaintiffs' Ex-

hibit 17, and the patents in suit, in structure, mode of operation, and results. A. Plaintiffs' Exhibit 1 appears to be a duplicate of Exhibit 17, although made in different mold, as can be seen by the shape of the core sections.

Q. That is, Plaintiffs' Exhibit 1, assuming the slot cut through? A. Yes. They both appear to be Ford pistons for the Model A four-cylinder car, and hence what I have said with reference to Exhibit 17 may be said with the same force with respect to Plaintiffs' Exhibit 1.

Q. That is, with respect to the comparison of the two in construction, mode of operation and results, with the patents in suit? A. Yes.

Q. Which ones of these pistons, Exhibit 17 or Exhibit 1, were on the market first in order of time, I mean? I don't mean those particular pistons; I mean pistons of that type made by the plaintiffs' licensees. A. I think Exhibit 17, so far as my knowledge goes.

Q. Now, assuming that the slot was not cut through in Plaintiffs' Exhibit 1, would you compare that in structure, mode of operation and results with the disclosures in the Mooers and Schmiedeknecht patents in suit?

Mr. Bruninga: I may say they are never intended to be used that way at all; so you might just as well leave that out. I don't know of a single one that has been used without the slot cut all the way through.

Mr. Richey: Well, they were sold that way.

Mr. Bruninga: They are sold that way; but they are, as this witness may know, for the reason they are fitted to the cylinder first and then slotted; never used in an engine, never intended to be used, without that slot cut all the way through. So the question of comparison of the Mooers patent, as to whether the slot is cut through all the way or not, is utterly immaterial to this case.

Mr. Richey: You can infringe the patent by making, selling, and using. You might make an article, sell it, and never use it.

The Master: Oh, I think the testimony is competent. You may meet it if you desire.

A. All that I have said with reference to Plaintiffs' Exhibit 17 with reference to the Mooers and Schmiedeknecht patents applies as well to Plaintiffs' Exhibit 1 if the slot is not completed.

Q. Will you compare Plaintiffs' Exhibit 8, the Ray Day piston, with the slot cut through, in structure, mode of operation, and results, with the Gulick, Jardine, and Mooers patents in suit?

(Thereupon adjournment was taken to 1:15 p.m. of the same day. Whereupon at 1:15 p.m. the hearing was resumed.) (Question read to witness.)

A. While the piston, Plaintiffs' Exhibit 8, differs in detail in construction from the specific drawing shown in the Gulick patent, it has the complete separation of the skirt from the head at the top of the skirt the same as Gulick, and the longitudinal slot in one of the thrust faces, the same as Gulick, and has the same mode of operation, and produces the same results. In so far as the construction is concerned, the webs connecting the head and the skirt have approximately the same construction as in Fig. 1, for example, of the Gulick patent, from the head to the central part of the boss. The boss in the Gulick construction is, however, completely supported by the webs and not at all supported by the skirt portion immediately adjacent the outer extremities of the bosses. In the Ray Day construction, the bosses are partly supported by the webs and partly by the skirt portion itself. The webs are made flexible, the same as in the Gulick construction. The webs are not attached to the skirt below the bosses, as described specifically in the Gulick drawings.

As mentioned at another time, the Gulick construction shows no relief around the bosses, but the Ray Day piston, Plaintiffs' Exhibit 8, does show such relief. This relief, however, is shown in the Jardine patent in combination with slots to secure flexibility. In this respect the Ray Day piston has the construction of Jardine and operates like Jardine and produces the result of Jardine. The Ray Day piston has a horizontal slot at the top of the skirt, as mentioned before, the same as the Mooers construction, and the connection between the head and the skirt is moved to the inside of the piston so that the heat flows from the piston head to the skirt through restricted areas. At these areas of connection Mooers shows relief of the piston skirt and the same type of relief is found in the Ray Day piston, Plaintiffs' Exhibit 8, adjacent the portion which would become hottest in operation of the piston, namely, in the region around the bosses; so from that standpoint, the Ray Day piston, Exhibit 8, has the construction similar to Mooers and

mode of operation in that respect similar to Mooers and results similar to Mooers.

Q. Would the part of your preceding answer which refers to the Mooers patent apply to Plaintiffs' Exhibit 9? A. Yes.

Q. Would you look at this Defendants' Exhibit AAA? You said this morning that this piston was manufactured by the licensees of the plaintiff. Is there any variation in such pistons with respect to the length of the longitudinal slot? A. Yes; the longitudinal slot may be open at both ends as well as open at one end only.

Q. And state whether or not in your opinion pistons like Exhibit AAA with these slots in the various forms you have mentioned would possess any features of any of the patents in suit? A. In my opinion the piston AAA does embody a number of the features of the patents in suit. In addition to the other elements I have mentioned, this piston has in it what is known as an Invar steel strut. This particular piston contains two struts: one above either boss, and the struts are roughly perpendicular to the axis of the wrist pin. These struts are cast into the aluminum at the time of manufacture and by virtue of their low co-efficients of thermal expansion, exert a powerful restraint against the expansion of the aluminum when the piston is heated. The piston is also provided with a horizontal slot at the top of the skirt which separates the head from the skirt with an air gap, thereby permitting the piston to operate at a lower temperature than would obtain if the skirt were connected to the head around the periphery. The skirt is also relieved around the boss. In some cases the restraining effect of the Invar strut is so powerful, at least in conjunction with the means to keep the temperature low and the relief of the skirt, to compensate for the excessive expansion of aluminum at the top of the skirt. In such cases it is desirable to provide for some means of flexing at the bottom of the skirt. There are also some involved changes in the piston itself due to the forces set up as a result of the unequal expansions of the steel parts and aluminum parts, which perhaps need not be further mentioned here.

The commercial history, however, of this type of piston proved that some means of flexing was essential for success. Strenuous efforts were made to produce a satisfactory strut piston which would have no flexing means. So far as I am aware these efforts all failed and the com-

mercial strut pistons today all use some means of flexing either the entire skirt or the bottom portion of the skirt.

Q. What mileage in automobiles is realized by these pistons like Exhibit 17 and Exhibit 1 with the slit through and Defendants' Exhibit AAA?

Mr. Bruninga: Objected to unless this witness has knowledge of it.

Mr. Richey: Well, he has qualified himself upon that.

Mr. Bruninga: I would like to have him state that he has knowledge of that.

A. Yes, I have knowledge of the life of this type of piston, both the Invar strut type and the so-called all-aluminum type. I have personally operated a set of the Invar strut type more than thirty thousand miles and I have observed tests on the block in the laboratory running up to forty or fifty thousand miles of the all-aluminum type. I know from my contact with the automotive industry and with the aluminum piston business that these pistons will run up to fifty thousand miles or more, if the car is properly taken care of.

Mr. Richey: Now, yesterday, Mr. Bruninga offered in evidence this Exhibit BBB during our prima facie proof. I don't know what the purpose of his offer was. What was your purpose in offering this BBB in evidence?

Mr. Bruninga: Well, that is being made, I mean that is being sold by the particular defendants in this case, and there was no objection made, and I would like to ask you right now if you consider that as an infringement.

Mr. Richey: That is what I was coming to. When we answer that, we would like to answer it completely; therefore we have to take this and consider it carefully in connection with the patents, because I have no doubt you will want us to declare on the claims, too.

Mr. Bruninga: Yes.

Mr. Richey: And we are not prepared to do that at the present time; so I would like to recall Dr. Jeffries when we are prepared to do that, which I think we will be before we get out of our prima facie case.

Mr. Bruninga: That is perfectly satisfactory.

Mr. Richey: Of course this Exhibit CCC,—he didn't say he sold that piston.

Mr. Bruninga: He didn't say that. Now, in connection with Exhibit AAA, that was simply produced and identified and offered in evidence to show what the particular defendant was selling. I don't know whether I asked him where he obtained it.

Mr. Richey: You don't mean defendant.

Mr. Bruninga: One of the defendants was selling. I don't know whether I asked him whether he obtained that from a licensee. I couldn't anyway, because we didn't know who the licensees are.

Mr. Richey: We will concede he bought it from one of the licensees of the plaintiff.

Mr. Bruninga: I just want to have before the court the piston that this man was selling.

Mr. Richey: I have one more matter with this witness. I would like to have a recess for a few minutes until Mr. Burton comes here. In the meantime we have the reports Mr. Whitney talked about yesterday.

(Short recess taken.)

Mr. Richey: We have produced these royalty reports that Mr. Whitney testified about. Mr. Bruninga said he thought it would only be necessary to produce specimens of them. They are picking them out now. I can go ahead with the witness.

Mr. Bruninga: I can pick them out later.

Thereupon ZAY JEFFRIES resumed the stand.

By Mr. Richey:

Q. Doctor, you have gone over these royalty reports Mr. Whitney testified about yesterday? A. I have looked over some of them, yes.

Q. Are there code numbers on those reports? A. Yes.

Q. What do those numbers refer to? A. Blue prints.

Q. What do those blueprints illustrate? A. In so far as the Aluminum Company of America records are concerned they refer to the prints of piston drawings.

Q. What kind of pistons are shown in those drawings as compared with the exhibits here? A. I took off a number of specific blue-print numbers from the reports, not knowing what they were, but representing hundreds of thousands of pistons. Each one of them proved to

be a piston with some kind of provision for flexible skirt, all mostly pistons like Plaintiffs' Exhibits 1 and 17.

Q. You mean 17 and Defendants' Exhibit AAA? A. I mean 1 and 17 being alike; most of them proved to be that.

Q. Wait a minute. 1 is this defendants' piston without the slit completed. Did you mean to refer to that? A. Oh, they are like Plaintiffs' Exhibit 17, because they call for the completion of the slots.

Q. And these reports were from what companies? A. This is the Aluminum Company of America.

Q. And there were reports there from others? A. Oh, yes, there were reports from Bohn Aluminum & Brass Corporation, and Aluminum Industries, I think some earlier reports, too, from Levett.

Q. Are you familiar with the pistons made by these people covered by these reports? A. Yes, in a general way.

Q. You didn't check the code numbers on those? A. No.

Q. Well, state in a general way. A. They are similar to the pistons made by Aluminum Company of America.

Q. And when you say "similar" just what do you mean? A. I mean they are made for the same cars, with the same general construction, and the same mode of operation.

Q. The same in substance? A. Yes.

Mr. Richey: Now, we produce those reports for our adversaries to use in cross examination if he wants to, either specimens or all the reports. I don't think there is any use of putting them in evidence, but we didn't want to take them away from the plaintiff. I don't think they are competent; and we have also produced the licenses here. I feel, as I said yesterday, that they are incompetent and just increase the bulk of the record. The only thing competent on the question of commercial success and public acquiescence is the fact that there have been licenses granted, royalties paid, and large numbers sold, and the licenses don't have anything to do with that.

CROSS EXAMINATION OF MR. JEFFRIES by Mr. Bruninga.

Q. Dr. Jeffries, how much practical experience have you had in the actual manufacture of pistons, particularly aluminum pistons? A. Well, I have spent most of the summer of 1916 in the actual manufacturing operations of aluminum alloy pistons, even going so far as to operate molds. And then I have spent a considerable amount of time in the piston plant, working on piston problems of one kind or another, mostly when troubles came up.

Q. Your experience in the summer of 1916 was with the regular trunk piston, unslotted and unrelieved, and so forth? A. Yes.

Q. You never had any experience in the actual fitting of pistons to a cylinder? A. No, not to do it with my own hands.

Q. So far as the split pistons are concerned, your experience has been a matter of observation and watching what others do and drawing your own conclusion; is that right? A. Well, yes, and also getting the conclusions of others and examining pistons after they have come out of motors to see what the results of tests were and things of that sort.

Q. You have never been an engineer in an automobile manufacturing plant? A. No.

Q. You never have had the job of designing any pistons for actual use in automobile engines? A. No.

Q. Never had any experience in actually making them? A. You mean machining them?

Q. Machining them? A. No.

Q. And you have never had any experience in actually fitting them? A. No, not with my own hands.

Q. Now, you referred to the Langmuir patent case in which you were an expert. That was a suit between DeForest Company and General Electric, was it? A. Well, no, I had in mind the one between General Electric and P. R. Mallory Company on gas filled lamps. The one with DeForest was on radio tubes, it wasn't a gas filled lamp patent. However I did give testimony in one of the other suits. No, it wasn't the Langmuir suit with the Radio Corporation.

Q. Now, the Aluminum Company of America suit that you say you have testified in, included the Kant-Skore case in Cincinnati in 1923; is that right? A. Yes.

Q. And the Sterling case in St. Louis, tried in March, 1931? A. Was it '31 or was it earlier? It was the Sterling case in St. Louis, at any rate.

Q. And that included the suit against United Engine & Machine Company in San Francisco last October, just a few months ago? A. Yes.

Q. And all those suits were on the so-called molding patents of Aluminum Company of America? A. Yes, molds, processes and articles.

Q. And I represented the United Engine & Machine Company in that suit in San Francisco, didn't I? A. Yes, as far as I know; you were there and tried the case.

Mr. Richey: We agree that you represented them. One of the lawyers.

Q. You used Exhibit 14 or one substantially identical with it in both the Sterling and United cases, didn't you? A. Yes, one showing the same type of section, at any rate.

Q. In the Sterling case Judge Faris held the process and product patents invalid and the other mold patents not infringed? Held the process and product patents invalid and the mold patent not infringed; isn't that it? A. Yes.

Q. That was about a year ago last September? A. I don't remember; about that time, yes.

Q. Now, in the Kant-Skore, Sterling and United cases you took the position that the things that made the aluminum piston a success were the process, product and molding patents involved in those suits; isn't that right? A. That is correct.

Q. And that the success of the aluminum piston really dated from the time that those so-called inventions appeared? A. That is correct.

Q. You did not stress the importance of these patents in suit, did you, in any of those cases? A. Yes.

Q. You did stress the importance of them? A. Yes. It was particularly brought out that the slotting of the skirt was current practice, both by yourself, Mr. Richey, and myself; and the importance of the great resiliency and hardness and strength of the metal in the permanent mold castings was stressed as having a very important bearing on the success of the slotted skirt piston.

Q. But you emphasized the fact that the production of those pistons under chilling conditions enabled the slotted structure to be used; isn't that right? A. Yes, practically.

Q. That was just about your position? A. That is practically the case. That is the history of it, too.

Q. And you emphasized the fact that before the advent of the slotted skirt from seven million to ten million pistons had been produced that were never slotted? A. That is correct.

Q. You also emphasized the fact that even at that time, that is, last October, the Reo Company still used non-slotted pistons? A. That is correct.

Q. Now, were you familiar with the aluminum piston business before December, 1915? A. No.

Q. You weren't familiar with pistons at all? A. No.

Q. The piston in use at that time was the trunk piston? A. The trunk aluminum piston? The trunk aluminum piston and the trunk iron piston, yes, those were the two pistons that were used at that time.

Q. And that piston was substantially the construction shown in Exhibit 14? A. Yes. Some of them had no wiping ring at the bottom. I might indicate by letter I (witness places letter on Exhibit 14). The first aluminum alloy piston that I knew about did not have this wiping ring at the bottom.

Q. But they had wrist pin bosses projecting inwardly from the sides of the skirt? A. Yes.

Q. Both iron and aluminum? A. Yes.

Q. And they had webs going across the piston head and going down to the skirt? A. Well, we call those ribs, but they have strengthening projections in the inside, at least some of them did.

Q. And both aluminum and iron pistons were relieved in the regions opposite the wrist pin bosses, on the outside? A. I think not. At least I don't recall that they were. We had one type of piston known as the hour-glass piston which did have relief all the way around the skirt. That certainly was relieved at the bosses but it was relieved in other parts of the skirt as well.

Q. But not relieved by an actual dishing in, for instance as in Defendants' Exhibit BBB? A. No, not that I recall.

Q. It was the practice at that time to make the head considerably smaller than the skirt? A. Yes, in the machining operation.

Q. Do you remember whether that was standard practice? A. Yes, that was standard practice.

Q. There was a certain standard decrease in diameter, isn't that right? A. I don't know whether it was

standard, but it was always—the head was always made smaller.

Q. It was also the practice to make the skirt of smaller diameter at the top than at the bottom? A. No, that wasn't the common practice. That is known as taper machining or taper grinding and was resorted to at times but it entails a more difficult and more costly machining operation than the cylindrical machining; so that was not resorted to commonly, as I recall it.

Q. These piston rings on such pistons were split so as to expand and contract? A. Yes.

Q. Now, taking a rib piston of that kind, in which the rib extends across the piston head, upon heating up of the piston the piston expands along the line of the wrist pin bosses, doesn't it; that is the greatest expansion, isn't it? A. In a trunk type piston?

Q. In a trunk type piston. A. Well, that depends entirely on the construction, on the disposition of metal in the piston itself. Expansion is fairly even in a trunk type piston in the different directions.

Q. Well, you have seen pistons relieved in the region of the wrist pin bosses on the outside, for instance, as in Exhibit BBB, not exactly but generally dished in, relieved area? A. Yes.

Q. You have seen ordinary trunk pistons made that way? A. Yes, I have.

Q. Why is that done in the ordinary trunk piston, un-split, whether of cast iron or aluminum? A. Well, it is done for different reasons, depending on the construction of the piston. Now, as I understand it, it is done in the trunk type cast iron piston largely because of the weaving effect of the wrist pin stresses on the skirt adjacent to the boss connection. It is desirable to relieve around these bosses to minimize the effect of this mechanical weaving. In certain of the pistons which I have considered on my direct testimony, it is done for the purpose of allowing space for metal to expand due to thermal and mechanical expansion.

Q. Where you have wrist pin bosses on the side of any trunk piston, isn't there a greater tendency to expand in that direction, that is, along the line of the wrist pin bosses? A. I don't see why there should be unless there is some special construction of the piston that makes that portion get hotter.

Q. But that does take place if you have ribs extending from the side walls and up to the top of the head, as

in Exhibit 14, along the line of the wrist pin bosses? A. It may, yes.

Q. Well, don't you think it does? A. Well, it possibly does.

Q. What is your opinion, is there any possibility about it? It is a fact, isn't it? A. Well, I think it may be either way. That is the boss section may be hotter or some other section may be hotter, according to the piston construction. I think if you show me a piston I may be able to tell you on that particular one whether the boss section should be hotter or whether the other section should be hotter.

Q. Now, what is the purpose of the piston rings in any kind of a piston? A. To serve as a seal against the gases passing by the piston into the chamber below, and also to serve as a seal against the passage of oil from the lower portions up into the combustion chamber.

Q. Does the skirt of a regular trunk piston such as shown in Exhibit 14, even without the rings, perform that function? A. Just the skirt?

Q. Yes. A. In part only.

Q. The minute you split it it performs it less efficiently, isn't that right? A. That depends on the force required to produce the flexing of the piston skirt. In fact, it may provide that function more efficiently before having been slotted.

Q. You had in mind a vertical slot, didn't you? A. Yes.

Q. That is what I had in mind. Now, suppose we take a horizontal slot across the piston skirt, say below the ring lands, don't the skirt then perform the function of sealing? A. To an extent, yes, but still it is not sufficient.

Q. Do I understand you want the Court to understand that if you cut a hole, a slot, in a trunk piston so that the gases can get past the piston rings and out through this slot, or that there is a communication between the interior of the skirt and that slot, that still that skirt performs a sealing function? A. Oh, not against the downward flow of the gases.

Q. Does it perform any function as to any flow of the gases? A. Not as to the gas flow.

Q. What does it seal, then? A. Well, it helps, it may assist with the oil pumping, that is, it permits a close fitting of the skirt at all temperatures, when the motor is cold and when the motor is hot.

Q. Well, all the world the skirt does as far as preventing the oil pumping is to wipe that oil up and down on the cylinder, is that right? A. Yes.

Q. In the piston such as Exhibit 17 or Exhibit 1, that skirt does not perform any sealing function whatsoever, does it? A. Not against gases. It gives a better bearing, of course the skirt is a better bearing at the bottom than it would be if the skirt weren't there.

Q. It simply performs a better oil distributing function, isn't that right? A. Yes, it does that. It also helps with the guiding of the piston in the cylinder barrel.

Q. And you immediately lose that in the Jardine patent piston when you take off the circumferential part just below the wrist pin bosses? A. Yes, that function is lost.

Q. That function is lost in every slipper type piston, isn't that right? A. Yes, I think so.

Q. The Jardine patent is a distinct slipper type piston, isn't it? A. The drawing shows slipper type, yes.

Q. Well, is there any statement in the specification distinctly saying that the parts can be extended around below the wrist pin bosses? A. No, I think not.

Q. What did you gather that from, the claim? A. Well, I don't know what the latitude of the disclosure might be, no.

Q. Now, the coefficient of expansion of aluminum you said is twice as great as that of cast iron? A. Yes.

Q. Approximately so. There is no practical trouble in a cast iron piston so far as taking care of expansion is concerned? A. It was not in the early days. It is not a problem like it is in the aluminum alloy piston. There is trouble with expansion, of course. That is, if a cast iron piston is not fitted properly, why, it does not function properly then, but when the cast iron piston or the cylinder wears there is trouble due to expansion. But, broadly speaking, the problem which is met with the aluminum piston running in the cast iron cylinder, as the result of high expansion of aluminum, is not a problem in cast iron.

Q. And the aluminum piston did not come into use until about 1915, according to your views? A. Yes.

Q. At least their use was so small it could hardly be counted? A. Yes, I know of no use prior to 1915.

Q. Now, where you use a cast iron piston, then your coefficient of expansion of your cylinder and the piston are the same? A. Yes.

Q. But as soon as you use an aluminum piston, then you have got the inside expanding at a greater rate than the outside, from a pure standpoint of coefficient of expansion? A. Yes.

Q. The piston rings, however, took care of that by splitting of them, is that right? A. You mean the piston rings provide the seal?

Q. Yes, provide the seal and they also, as the piston expanded, or even as the rings expanded, the expansion was compensated for by the split? A. Well, it was in the ring groove section, yes.

Q. Rings are still made of cast iron, even in aluminum pistons? A. Yes.

Q. In other words, in the ring you have an expansion joint between the ends of the ring? A. Yes.

Q. And that is what you really have in your skirt in these pistons, isn't that right, Doctor Jeffries? A. As one element, perhaps, of the skirt.

Q. But the seal provides an expansion joint in the skirt? A. It provides space for the flexing of the skirt, yes.

Q. Isn't that what is known as an expansion joint? A. Oh, I don't know that it could be so broadly defined. You have expansion joints by large curves, as in a pipe line, or something of that sort.

Q. You have the expansion joints of that kind, that is the space between the abutting ends or rails, haven't you? A. I don't know if it makes a lot of difference what it is called, I never heard it called an expansion joint before.

Q. Now, taking up the Mooers patent 1,402,309, that is a trunk piston, isn't it? A. It is not a typical trunk piston, but its skirt is a slotted trunk, as opposed to a flexible skirt type piston. It has, however, a horizontal separation between the head and the skirt which is not associated with the trunk type piston.

Q. Well, you take out the horizontal—you take out the slot running around the piston, and separating, or partially separating the head from the skirt, and you have a trunk piston, haven't you? A. A form of trunk piston but not a Mooers piston.

Q. The distinction then is that taking out that slot you have the connectors, 3? A. That is one distinction.

Q. And those are really ribs on the inside of the piston, aren't they? A. Possibly a rib or post. They are specifically called connectors here.

Q. You have read the specification of the Mooers patent very carefully? A. Well, I have read it.

Q. What was really the purpose of the Mooers patent, what did he specifically want to do as distinguished from what preceded him; in other words, what would you say he wants to do? A. He said he would like to make a piston that is light weight and toward that end he would like to utilize aluminum. He would like to make it simple enough in construction so that it could be manufactured in permanent molds. Then he would like to give it some kind of construction which would minimize the effect of the high expansion of aluminum alloy.

Q. When he said "simpler," simpler than what? A. Simpler than a previous construction he referred to as the Spillman & Mooers construction.

Q. Do you know what that construction was? A. Yes.

Q. He refers to that three times in his patent, doesn't he? A. I assume so, if you say so.

Q. And he says, "My present invention comprises improvement on the joint invention of myself and Edward O. Spillman disclosed in letters patent of the United States 1,092,870," and after another paragraph he says he further contemplates the idea of distributing the heat from the head of the piston more effectively than in the case of the construction illustrated in the patent 1,092,870; is that a fact? A. According to what he means by "effectively." The Spillman & Mooers patent, as I recall it, shows no boss relief, no skirt relief, at any place, whereas Mooers does show rather a generous relief in the skirt at points opposite these connectors where the expansion would be the greatest.

Q. Well, the Spillman & Mooers structure didn't require it, did it, Doctor Jeffries? A. That is correct, it should at least have heated quite uniformly throughout the circumference of the skirt on any cross section.

Q. This paper that I hand you is a copy of that Spillman & Mooers patent, isn't it? A. Yes.

Q. I hand you a cross section of casting. Will you state whether that is generally a fair representation of that Spillman & Mooers patent structure, looking at it just as a model?

Mr. Richey: I think I will object to that question. You haven't any right to go into the prior art at this time. I presume you might ask him about the patent itself, but when you go beyond that it

seems to me you are exceeding the direct examination in going into the prior art in our prima facie case, which you have no right to do.

The Master: This witness has testified to this Mooers patent. This Mooers patent refers to this previous patent. I think it is competent. The objection will be overruled and you may have an exception.

Q. I don't want to tie you down to any details. I thought it would be easier for the Court to look at a cross section than a drawing. You can later on, in rebuttal, if you want to, show any differences in dimensions. I just want to use it as a model. A. I think the section you have handed me is a fair duplication of the Spillman & Mooers construction.

Q. Now, in distinguishing the Mooers patent 1,402,309 from the Spillman & Mooers patent structure, 1,092,870, the prior patent has a connection direct from the head to the bottom of the skirt, isn't that right? A. Yes.

Q. And in the Mooers patent in suit the connection is between the top of the skirt and head itself? A. It is between the top of the skirt and the head itself, or between the top of the skirt and the ring flange, just as one may wish to interpret it. The boss construction shown in the Mooers patent goes down to the head.

Q. Is it your opinion that the flow of the heat, rather the efficiency of heat disposition of the Mooers patent structure 1,402,309, is more efficient than that of the prior patent mentioned by him? A. Oh, I think if you would take the question of the heat flow itself you will find that the Spillman & Mooers construction would probably take care of it somewhat better than the Mooers construction. However, that is only one element of efficiency of taking care of heat.

Q. The efficiency of heat transmission is due to the fact that the hottest part of the piston is connected with the coldest part of the skirt, isn't that right? A. Well, that is only one element. The heat has to travel a long ways in the Spillman and Mooers to get to the skirt, and it has a considerable cross section of metal through which to travel. In the Mooers patent it has to travel a shorter distance to get from the head to the skirt, but the section of metal through which it has to travel is considerably reduced. So those two factors oppose each other.

Q. In an ordinary trunk piston the upper part of the piston is the hottest and the bottom of the skirt is the coldest, and therefore you have a gradual expansion, being a minimum at the bottom and a maximum at the top of the skirt, in an ordinary trunk piston that is not isolated? A. That is correct.

Q. And that is also generally true if you have the head and the skirt isolated to an extent as you have in the Mooers patent 1,402,309? A. Yes.

Q. And that would bring out, or that brings out in the Mooers patent an unequal distortion of the entire skirt? A. Yes, especially at the top of the skirt.

Q. And in the Spillman & Mooers patent structure, however, you get practically a uniform application of the heat from the head to the skirt itself, circumferentially? A. Insofar as the conduction through the piston is concerned, yes.

Q. You would expect, then, a more uniform expansion of the skirt in the Spillman & Mooers patent structure, is that right? A. Yes, that is correct.

Q. Now, in the Mooers patent structure, if you omit the webs, I mean omit the connectors, 3, at right-angles to the wrist pin bosses, then all of the heat must flow right through the wrist pin bosses, isn't that right, unless those connectors are displaced circumferentially with respect to the wrist pin bosses, as for instance in some of the other views? A. As I understand it, you mean to eliminate from Fig. 1 of the Mooers patent the two connectors on the thrust faces?

Q. The two connectors on the thrust faces. A. What you say then, is correct.

Q. Now, in the Spillman & Mooers patent you have actually a shunting of the flow of heat on each side of the wrist pin bosses, haven't you? A. Yes.

Q. There is also a large radiating surface in the Spillman & Mooers patent structure? A. Yes, the same thing that makes the piston heavy and complicated, double-walled, gives it more surface to dissipate heat.

Q. That is also true of the Gulick patent structure? A. That is true of the Gulick patent structure.

Q. Do you know from your own knowledge whether the Spillman & Mooers piston structure has ever gone into use? A. No. If it has, it has been very limited application. The Spillman & Mooers patent doesn't even set out, as I view it, to produce a light weight piston, and there is nothing in the patent, as I read it, mentioning

aluminum alloy, so I believe that is a thing which Mooers did set out to do. He set out to get a light weight piston which these people did not.

Q. Do you know whether the Gulick patent mentions aluminum alloy? A. No, I think it does not.

Q. The Spillman & Mooers patent application was filed on July 18, 1913, and the patent was issued on April 14, 1914. That was prior to the time that aluminum piston came into use? A. Yes.

Q. That is what you contended in the other cases? A. That is it.

Q. It wasn't until this molding process was perfected that aluminum pistons were capable of being used commercially? A. That is correct. Or, at least, they weren't used commercially. If they were capable of it or not, I couldn't say.

Q. Do you know whether there is any structure like the Spillman & Mooers structure on the market today in aluminum, that is the idea of connecting the head proper with the bottom of the skirt? A. Not that I know of.

Q. You were in San Francisco during the trial of that case? A. Yes.

Q. Do you know whether the United Engine & Machine Company marketed a piston of that character? A. No, I don't know.

Q. You have never seen a piston of that character? A. Well, I recall a piston that was brought into the courtroom as a sample that may have had some such construction, but I don't recall the details of its construction well enough to compare it with the Spillman & Mooers, nor do I know that it is on the market.

Q. What companies on the west coast did you have in mind when you said some companies were using the patented structure of the patents in suit without authorization? A. Well, I had in mind United Engine & Machine Company, and another one in Los Angeles, I don't recall the name.

Q. Jens? A. No, that doesn't sound like it.

Q. Well, how do you know that the United Engine & Machine Company are making pistons in violation of these patents in suit? A. Well, the piston I saw.

Q. You have seen United pistons then? A. Yes.

Q. Sold under the name of Silvolite? A. Yes.

Q. They aren't of the construction then of the Spillman & Mooers patent? A. No.

Q. Can you tell me generally the construction? A. Well, they are more the flexible skirt type of piston.

Q. Can you produce such a piston? A. No, I have none.

Q. You cannot even—can you give the Court some information, since you have made the statement that that company is manufacturing and selling pistons in violation of the patent? A. Not right now. I think I could in due course produce a drawing of such piston, maybe one of the pistons.

Q. Will you try to get me one by tomorrow, if possible? A. Yes, I will.

Q. Now, you happen to know that the Cleveland Trust Company was the owner of that Spillman & Mooers patent prior to its expiration? A. That is my understanding, yes.

Q. Well, don't you know? A. Well, that is I know it in the same way that I know that the Cleveland Trust Company is the owner of these patents in suit.

Q. Just what somebody has told you? A. Practically so. A little more than that. I have sat in a number of conferences and discussions before this trust was formed, and I have lived with this situation 10 or 12 years, so in that way I feel I know a few things about these matters that I may not have gotten from the particular records which bear the proper signatures, and so forth.

Q. Well, your knowledge and information on the ownership of the patents in suit by Cleveland Trust Company is no better than your knowledge or information as to the ownership by the Cleveland Trust Company of the Spillman & Mooers patent? A. No better, no.

Q. You were consulted with reference to the Simmons case in this circuit, weren't you? A. Well, I conferred with the attorneys prior to the date of the trial of the Simmons case, yes.

Q. And you know that that particular patent was one of the patents in suit in that Simmons case? A. I believe it was.

Q. The Spillman & Mooers patent. A. I believe it was, at least at an earlier stage of the case.

Q. You also know that the accused device in that Simmons case was the same as Exhibit 1? A. I don't know.

Mr. Bruninga: Will counsel agree to that or will I have to produce the record?

Mr. Richey: I think that is right, certainly I don't believe there are any differences of any material importance between the two.

Q. Do you consider that permanent molding of the Spillman & Mooers patent structure is possible? A. Not the inside of the piston.

Q. But the outside is? A. Yes, the outside could be cast permanent.

Q. And that would produce a suitable piston, even with a semi-permanent molding process? A. So far as the outer bearing surfaces are concerned, it would.

Q. Well, you took the position in the Sterling and United cases that so-called semi-permanent molding with the metal mold on the outside and with the sand core on the inside came within the reasonable scope of the patent? A. Did I?

Q. Do you remember it, Dr. Jeffries? A. Yes, I remember it.

Q. Do you remember that you did? A. No, I don't remember that I did. I remember that I said that the same permanent mold process was capable of producing a structure with a sufficient degree of chill for the metal to act as a bearing against the cylinder walls.

Q. Then except for the matter of ease of casting, the Spillman & Mooers patented structure would be entirely feasible as a piston? A. Well, it would be feasible; it would be heavy; it does possess the structure which keeps the skirt about as cool as any structure of which I have knowledge, and it also produces a skirt structure which is very free from distortion, either thermal or mechanical.

Q. You know, don't you, that the Cleveland Trust Company prior to the date of the expiration of the Spillman & Mooers patent on April 14, 1931, collected royalties under that patent, as well as some of the other patents? A. I think they included that in the group of patents under which royalties were collected.

Q. And those royalties were collected on all the pistons that you have testified about as being licensed? A. Yes.

Q. Now, isn't it a fact that the Mooers patent structure is a compromise between efficient transmission of heat and ease in securing molding? A. Yes, and also in lightness.

Q. What Mooers really did was to leave the exterior structure of the piston substantially the same as in the previous Spillman & Mooers patent and modify the interior structure so as to enable the casting to be readily made? A. He did more than that. He provided the

means on the outside of the piston to compensate for the added temperature expansion or thermal expansion and the added mechanical expansion at the top of the skirt.

Q. Such a relief wasn't necessary in the Spillman & Mooers patent structure? A. It was not, if sufficient clearance were provided.

Q. Such relief was quite common, wasn't it, in 1917? A. Not that I know of.

Q. Well, it was known to you, wasn't it? A. I believe not.

Q. You didn't, as early as 1917, see any pistons which were relieved, aluminum pistons or otherwise, in the regions opposite the wrist pin bosses? A. Well, if I did I didn't associate it with the functions described by Mooers.

Q. Dr. Jeffries, if you took any piston, no matter what date it was, any trunk piston, whether 1915, or 1815 or 1931, and you put it in a cylinder of an automobile engine, of a gas engine, and subjected it to heat, that piston expands, doesn't it? A. Yes.

Q. And that expansion has to be taken care of? A. I don't say it has to be. It will be if it can be.

Q. And as a matter of fact you will find the wear, when you take the piston out, opposite the wrist pin bosses, will you not? A. Sometimes. Sometimes you find it all around; sometimes you find it on the thrust faces.

Q. And what is the practice of a mechanic, if he finds one part fitting in another wearing in certain zones? A. He may have a good many practices. He may try to improve his oiling. He may try to change the dimensions. He may try to change the structure of the part that is bearing on the other part.

Q. But he wouldn't use a file to file down those places where wear takes place, is that your idea? A. Well, he might and he might not. But if he used a file he might not have a very good bearing surface when he got through.

Q. But you do know that is the practice today to provide for reliefs opposite the wrist pin bosses? A. Yes, I know that is the practice today.

Q. In the Mooers patent structure the connectors of the Spillman & Mooers patent structure are moved outwardly until they become one with the walls; is that right? A. I don't exactly know why you should say they are the connectors of Spillman & Mooers. The con-

nectors are integral with the wall in the Mooers construction.

The Master: At this time we will recess until tomorrow morning.

(Cut in half piston section offered for identification as Defendants' Exhibit EEE.)

(Thereupon at 9:30 a. m., Friday, January 20, 1933, the hearing was resumed; counsel present being Messrs. Bruninga, Richey and McCoy.)

Mr. Richey: Before we start this morning I wish to make a statement about this Exhibit BBB. Plaintiffs think that the piston Defendants' Exhibit BBB infringes the following claims already declared upon: Gulick patent claims 1, 13, 15, 18, 22, 27, 28, 29, 30, 33, 35, 36, 37, 38, 41, 42, and 43.

The Jardine patent claims 1, 8 and 10.

The Maynard patent claim 6.

The Mooers patent claims 1, 2, 3, 4, 6, 10, and 11.

Without prejudice to any right to bring suit against any one now a defendant or any time held to be a defendant in this suit upon other patents that may be now or in the future owned by the plaintiff, the plaintiff charges infringement in the instant case of the claims above announced by the piston Defendants' Exhibit BBB.

Mr. Bruninga: But you are not including the Schmiedeknecht patent?

Mr. Richey: No, we don't charge that device there infringes any claims of the Schmiedeknecht patent.

Mr. Bruninga: And if I understood you correctly, but one of the claims of the Maynard patent is infringed by this particular piston?

Mr. Richey: That is our position; that is our contention.

FURTHER CROSS EXAMINATION OF MR. JEFFRIES by Mr. Bruninga.

Q. Dr. Jeffries, I want to be sure that the court understands the procedure of permanent molding because it enters into this Mooers patent. Now, check me up if I am not correct on this, and I will briefly summarize rather than have you do it. In the permanent molding of the pistons, of such pistons as Exhibit 1, a pair of outside

mold parts, shaped to correspond to the outside of the piston, are used, and then for the inside there is a core made up of parts, in this particular case a center core piece which can be seen by the markings on the inside, and a couple of side core pieces, the three core pieces being shaped to the interior of the piston. And then a suitable gate is provided so that the metal can be poured into the mold, and the center core part is withdrawn, then the two side core parts are moved in to disengage them from the interior of the piston. That is generally the procedure, isn't it? A. Yes.

The Master: As I understand, the permanent mold is something that can be withdrawn and leave the form of the thing that is being molded without disturbing it, isn't it?

Mr. Bruninga: Well, I want to ask this witness what is meant by permanent molding. Permanent molding as applied to molding with metal as distinguished from molding with sand.

The Witness: Generally speaking, I think there are other types of material used in permanent molds, but a permanent mold, as his Honor said, is one that can be used over and over again to make the same type of casting.

The Master: That is the point I wanted to make clear.

Mr. Bruninga: But the point I wanted to make clear is the interior configuration of the core, in order to throw some light on the witness' position that the Spillman & Mooers piston is difficult if not impossible to make with a metal core.

Q. You would say the Spillman & Mooers structure will be impossible to make with the permanent or metal inside core? A. So far as the present art is concerned, that is true.

Q. But the mere fact that an interior structure is complicated does not mean that it cannot be made in the permanent mold? A. Not always. The internal structure may be so designed that it can be cast in the permanent mold.

Q. For instance, you know that the piston that I am handing you is made in the permanent mold and with the permanent core?

Mr. Richey: I object to that; nothing he was asked about in his direct examination.

Mr. Bruninga: I don't intend to use it as prior art; I just intend to use it for illustration at this point.

A. Yes; that piston was made in a permanent mold.

Mr. Bruninga: The piston is marked for identification as Defendants' Exhibit FFF.

Q. It is your contention that the Ray Day piston structure, that is, the one of the Exhibits 8 and 9, cannot be made with the permanent core? A. Yes; that piston to the best of my knowledge at the present time could not be made in a permanent core.

Q. But still, according to your position it still incorporates some of the features, at least, of the Mooers patent 1,402,309? A. Yes.

Q. So that the question of whether the Spillman & Mooers structure can not be made in the permanent mold and the Mooers patent structure can be made with the permanent mold, is not determinative at all as to what the patent structure is? A. Well, it may not be absolutely controlling; it is important, however.

Q. Well, it is not the distinguishing feature of the Mooers patent that it can be made with the permanent core? A. Distinguishing over Spillman & Mooers?

Q. Yes. A. Oh, no. That is not the only distinguishing feature. It is not only the different construction, but it is lighter and different mode of operation.

Q. The matter of whether a piston can be made with the permanent core is really a production proposition? A. Some times. Some times it is a matter of metal quality, too.

Q. The Mooers patent 1,402,309, page 3, lines 47 *et seq.* contains the following statement, after describing the operation in the preceding sentence, reading as follows: "Thus when this top zone of the guide heats up the resulting expansion can be accommodated by outward movement of the relieved part of the wall and danger of seizing, as a result of close engagement between the unrelieved part of said wall and the cylinder, is obviated."

The part to which I call attention reads as follows: "This action, of course, is made possible by the fact that the upper end of the guide section is not continuously joined to the head section, but, being separated from the head by the air gap, is free to take form in a measure independent of the head."

In the Spillman & Mooers structure, described as shown for instance in Figs. 12, 13, and 14, these connectors 3 are spaced around the piston circumferentially out of line with the wrist pin bosses? A. To which figure do you refer?

Q. Figs. 12, 13, and 14. A. Yes.

Q. Now, page 2, line 30 of the patent reads as follows: "It will be understood that this relationship might be that of a poor mechanical fit or joint which would be a poor conductor of heat, as compared with the metal of the head 2 and connectors 3, so that such heat as did pass from the head 2 to the skirt 1 would do so principally by way of the connectors 3, rather than from the head to the upper end of the skirt 1 directly." What do you understand by that statement? Does that mean an air gap, as, for instance, shown in the drawing, or some fit connection? A. That means the air gap, as I understand it.

Q. When he refers to a poor mechanical fit, doesn't he contemplate eliminating the gap and having the skirt and the head abutted right up against each other with perhaps some slight air gap between or perhaps a piece of asbestos between? A. No, I don't see anything that would suggest that. Where he states that the relationship might be that of a poor mechanical fit or joint, would be a poor conductor of heat, that is, I think he is merely stating a poor mechanical joint would be a poor heat conductor, and this acts in the same general way so far as heat conducting is concerned.

Q. He is intending to disclose something, or did intend to disclose something else than an air gap? A. Where?

Q. In that part he contemplated something else than an air gap? A. I don't see any place.

Q. I mean in that particular sentence there. A. Oh, I think not, except merely to refer to how the air gap functions as a heat conductor.

Q. You would think then that the sentence there is superfluous? A. I think it is explanatory.

Q. Now, as a matter of fact in the Mooers patent structure the connectors 3 are restricted heat flow connecters, aren't they? A. In part, yes.

Q. Do you really think much of that patent, the Mooers patent, as an advance in the art over the Spillman & Mooers patent, from the engineering standpoint? A. Not the completed result, no. That is, if the thing had been stopped there, the final result as we now know it would not have been achieved. But there are elements

of construction in the patent which are very important.

Q. Well, it is sufficient to hang the claims on, isn't that right?

Mr. Richey: Oh, I object to that. Why ask the mechanical expert those questions about that?

The Master: He may answer. Overruled.

A. I think the disclosure, so far as I am aware, is the first one which covers a piston of light weight with a head substantially cut away from the piston so as to keep the skirt temperature down in part, and yet sufficiently connected to take care of mechanical stresses, and at the same time guide the heat into the skirt and compensate for the extra expansion which results from that extra temperature and also allow for distortion of the skirt at the top where it is the hottest and where clearance is hardest to provide. The same principles are combined with other factors in the commercial pistons of today.

Q. But the statements you have just made, how does that distinguish from the Spillman & Mooers patent structure? A. Well, the Spillman & Mooers structure is of course entirely different from that of the Mooers. The connection between the head and the skirt is made from the flat disk of the head to near the bottom of the skirt, and the connection of metal on the head proper is continuous and the connection on the skirt at the bottom is continuous; so that from the standpoint of construction they are entirely different. Now, from the standpoint of mode of operation they are entirely different. The Spillman & Mooers construction does provide for keeping the temperature of the skirt down, especially in so far as the mechanical expansion is concerned. Even in the Spillman & Mooers the top of the skirt must get pretty hot, because the piston moves up and down in the cylinder. When the piston is at the top of the stroke and the explosion occurs, the gases are heated to a very high temperature and they continue to exert pressure on the piston as it moves down the barrel. So that at the bottom of the stroke, perhaps, the piston would be in some position like that (indicating with physical exhibit on chart Exhibit 14), and the hot gases are all in here on the cylinder wall. Now, as this piston moves upward, the heat from the walls is given directly to the skirt, particularly at the top, whereas the bottom of the skirt may not get so hot because it works up and down in a region where the hot gases never have the opportunity to

heat up the cylinder walls. So that does not mean there is no expansion problem in this Spillman & Mooers construction. Furthermore, the Spillman & Mooers operation is one in which the whole side thrust from the explosion stroke must be taken from the pressure on the head to the support at the bottom of the skirt, and the full head section acts as a cantilever in the operation, and one can take this piston,—I can take it in my two hands—and weave it; you can see that whole head weave with respect to the top of the skirt. Now, you could not do that with the Mooers construction, so that the mode of operation is different.

Q. Then the Spillman & Mooers piston is, in plain language, no good? A. In this particular form I think it would function probably a little better than the trunk type piston, but perhaps extra care would be required in fitting the head portion, which is not required in the Mooers construction alone.

Q. But the structure, function, and mode of operation is different from that of the Mooers; is that right? A. Yes.

Q. You understand, of course, The Cleveland Trust Company brought suit on that Spillman & Mooers patent on account of the making of this particular piston in suit?

Mr. Richey: We have been over that once.

Q. But you understand further that in order to establish infringement, structure, mode of operation, and result must be the same; and do you still say now the structure, mode of operation, and result of Spillman & Mooers is different from that of Mooers? A. Yes, I say that.

Q. Is it your opinion, Dr. Jeffries, that Defendants' Exhibit BBB incorporates the features of the Mooers patent 1,402,309? A. Yes.

Q. Will you tell me why? A. Because the connection between the head and the skirt has been moved to the inside of the piston structure, the same as is shown here on Mooers.

Mr. Richey: Referring to Fig. 1 of Mooers.

The Witness: Yes, Fig. 1.

Mr. Richey: Point 3.

The Witness: In Mooers, at the horizontal slot. And because the head is partially cut away from the skirt, leaving the air gap on the greater portion

of the circumference between the head and the skirt, and because of the places where the connections are between the head and the skirt, the skirt section is relieved for the purpose of allowing for extra expansion of the piston at those points.

Q. I show you a cross-section of a piston corresponding to Exhibit No. 1. That corresponds substantially, doesn't it, with Exhibit 1, that cross section? A. Yes.

Q. It is intended to, anyway.

Mr. Bruninga: I want to mark it for identification Defendants' Exhibit 3G.

(So marked.)

Q. Now, compare that with Exhibit EEE, and you find that in both cases there is a connector from the head to the skirt, in Exhibit 3G it is partly from the ring flange and partly from the head, while in Exhibit EEE it is from the head; that is the general distinction, isn't it, the connection?

Mr. Richey: I object to that question as it relates to the prior art of the Spillman & Mooers patent. If he did have any right to inquire about that with respect to Mooers, which I challenge, he certainly hasn't any right to talk about the prior art in connection with these other pistons of the patent.

The Master: The same ruling; he may answer and you may have your exception.

A. What I have said might indicate that this connection directly to the flat portion of the head in Defendants' Exhibit 3G is the main part of the connection between the head and the skirt, which of course it is not. The main part of the connection between the head and the skirt in Exhibit 3G is the metal between the ring flange and the skirt rather than metal from the flat of the head to the skirt; whereas in the Spillman & Mooers the connection is entirely from the flat of the head to the skirt, and then the connector goes way down and nearly to the bottom of the skirt, whereas the connector in Exhibit 3G is only the width of the slot.

Q. In other words, the connection to the skirt is made higher up in 3G? A. Yes, a different order of magnitude as to distance.

Q. Well, it is higher up? A. Very much higher up, yes.

Q. But in each case, 3G and EEE, the wrist pin bosses are carried by the connector or by the webs, you may call them? A. Yes; the wrist pin bosses are carried in the web in Exhibit 3G, but hardly in the connector in 3G, if we consider the connector only of length equivalent to the gap at the head, whereas the connector in the Spillman & Mooers is equal to three-fourths the length of the piston.

Q. You define the connector then as being where the bottom connects to the skirt or where the top of that connects to the skirt? A. Well, I would say that the connector, so far as its business function as a connector is concerned, would be limited by the two parts which are connected. So the connector in the Spillman & Mooers is seven-eighths the length of the piston, or three-fourths, whereas the connector proper in Exhibit 3G is on the order of say a quarter of an inch.

Q. That is a matter of words, isn't it, Doctor? A. Oh, it may be, but the constructions are there and clear and any one can see what they are.

Q. The two constructions look deceivingly alike, don't they? A. No, not to me.

Q. You think the construction in the Mooers is more like 3G than EEE? A. Whether it looks like it or not, it surely is.

Q. Now, the flow of heat from the head to the skirt, whether we take it through the medium of the ring flange or any other way, is downwardly around the wrist pin boss to the skirt in either case, isn't that right? In other words, you have got this branching of the skirt around the wrist pin? A. Why, no; in this Exhibit GGG most of the heat that goes from the head to the skirt shunts the wrist pin boss.

Q. And it doesn't at all in the Spillman & Mooers boss? A. Well, it can reach the skirt through a very short channel in Exhibit 3G, and it must go below the wrist pin boss before it can reach the skirt in the Spillman & Mooers construction.

Q. But there is a heavy thermal connection, heavy metallic connection, between the head and the top of the wrist pin bosses in 3G; isn't that right? A. Well, it is fairly heavy, yes, but there is a short connection from the head across to the skirt, and the length of travel is very important in heat conduction.

Q. Now, in the Spillman & Mooers construction there is actual relief in the skirt opposite the wrist pin

boss? A. Not so intended. There is a hole for putting the wrist pin in.

Q. You wouldn't call that a relief because it is a hole; but you would call it a relief if it is a hole which is widened out at the top as in the Mooers patent? A. Well, I would call it a relief when the patent says it is a relief for that particular purpose. But we know there would be no way of getting a wrist pin into this piston unless the skirt were cut away.

Q. Would the skirt have to be cut away more than the diameter of the wrist pin, if it was widened? A. Not if the casting on the inside had been relieved from this skirt. (After examining) But I suspect the easiest way to cast this would be to cast the skirt and the outer end of the boss integral and cut them away later.

The Master: You are looking at Exhibit what?

The Witness: Spillman & Mooers piston Exhibit EEE. I am not sure how that was done in that exhibit.

Q. But the patent does show, the Spillman & Mooers patent 1,092,870, does show considerably enlarged openings 13 in Fig. 2? A. Yes; but it has no function; it has no work to do in this patent, in this construction.

Q. And in the Gulick patent piston the hole 24 is rather small, just enough to get in the wrist pin; is that right? A. That is correct. No relief is contemplated in the Gulick patent, in the Gulick construction shown.

Q. But at least one of the purposes of the hole in the Spillman & Mooers construction is to permit oil to enter through the hole 13 in Fig. 2, that is clear from page 1 lines 99 to 101? A. Yes, it is so indicated.

Q. One of the distinctions that you pointed out is that in the Mooers patent structure the connectors spring from the ring flange rather than from the head itself in the Spillman & Mooers patent; that is one of the distinctions, isn't it? A. Yes.

Q. But still you contend that the Ray Day construction in which the connection springs right directly from the head, that still embodies the features of the Mooers patent? A. Yes.

Q. So the matter of springing the connectors from the head is not of so much importance? A. Well, that is in combination with the boss relief in the Ray Day construction.

Q. Now, in the Ray Day construction what you really have is a boss connected with the skirt, with the connector coming down and connected at one side, and at the other into the boss. You have in the Ray Day construction, as compared with the Mooers patent structure, Fig. 1, a boss connected with the skirt, but the connection from the head to the skirt is made to the boss, to the inside of the boss? A. Yes, that is true.

Q. That is about as different from the Mooers patent structure as you can imagine; is that right? A. No.

Q. You think the flow of heat will be the same? A. Not exactly, no.

Q. As a matter of fact, isn't the Spillman & Mooers patent structure closer to the Ray Day than you can say of the Mooers patent structure? A. No.

Q. You still contend that there is greater similarity between Ray Day and Mooers than there is between Ray Day and Spillman? A. You have short connectors in the Mooers, for one thing, and the direct flow of heat to a certain spot, and then you relieve around that spot. Those things are in combination in Mooers; they are not covered at all in the Spillman & Mooers; and they are present in the Ray Day piston.

Q. Even though the connection would flow the heat from through the wrist pin boss in Ray Day and directly through the skirt in Mooers? A. I think so.

Q. Now, in defendants' piston structure as compared with the Mooers structure, the connection is made at two wide connecting zones; isn't that right; one on each side? A. They are connecting zones and they are wider than the connection shown in the Mooers drawing.

Q. Would you say just a little bit wider? A. No; you have two connectors in the defendants', and the drawings in the Mooers show four. Taking the total connections, it is probably not a great deal different.

Q. In defendants' construction, as you have previously stated, it is your position that there is a branching flow around the wrist pin boss from the head to the skirt? A. That is correct.

Q. But in the Fig. 1 construction of Mooers, why the connections are directly above the wrist pin bosses? A. Two of the connections, but they reach the skirt before they do the bosses.

Q. Do you know whether the Mooers patent structure has ever gone into commercial use? A. No, I do not; just as it is shown there. If it has been used, it has been very small.

Q. You know it is the first patent that went into the Cleveland Trust? A. No, I didn't know that.

Q. You didn't know that. Now, take up next the Schmiedeknecht patent. Schmiedeknecht's purpose was really to reduce weight, wasn't it? A. Yes, it was.

Q. And for that purpose he cut holes in his piston 16? A. That was one of the things he did, yes.

Q. You weren't familiar with the piston business in 1917, were you? A. Yes.

Q. Quite common to cut holes in pistons, wasn't it? A. Yes, it was to make what is known as skeleton pistons; even bored holes in the skirt.

Q. You called attention on direct examination to the skeleton piston construction, what that construction was, and as I understood, it was used long prior to the patents in suit? A. Yes.

Q. What was one of these structures? A. Well, a skirt with the holes bored through it.

Q. And that is just about what the Schmiedeknecht amounts to? A. No.

Q. One big hole instead of a little, small one, or two big holes? A. No; I think Schmiedeknecht recognized the more basic difficulty in the construction of thin-walled pistons, namely, that the thin-walled skirt was not sufficient support for bosses by cantilever construction; that is where the bosses are suspended entirely from the skirt walls.

Q. But that has been retained in cast iron pistons to this day, hasn't it, the so-called cantilever construction? A. Not only has it been retained, but the heavy-walled cast iron piston has also been retained. That is, the difficulties of making a light weight cast iron piston apparently are too great for the industry to solve at the present time. When they want light weight, they go to aluminum.

Q. You and I were both then looking at the piston head of the piston I have in my hand. That is the general old cast iron piston that has been in use for a long time, the general structure, I don't mean the details? A. Well, I don't know as to the detail of the inside construction. It will be noted that the boss is ribbed in the piston which you have in your hand, which apparently has no exhibit number.

Mr. Bruninga: I mark the same for identification as Defendants' Exhibit 3H.

Q. It was quite common to rib bosses like that in 1917, wasn't it? A. I don't recall.

Q. Now, Mr. Schmiedeknecht absolutely wanted to avoid the use of aluminum, didn't he? A. He apparently wanted to make a light weight cast iron piston, that is correct.

Q. Now, as a matter of fact, Mr. Schmiedeknecht supports his wrist pin bosses between a web and a head; in othe words, at the end of the bosses? A. In the drawings shown, that is true.

Q. Does he describe anything else; does he even intimate he wants to support it in any other way?

Mr. Richey: I object to the question as immaterial. The patentee is entitled to his equivalents whether he describes it or not.

The Master: Same ruling; he may answer.

A. I see no specific reference to any other general type of construction. The wording, of course, is susceptible of some latitude, but so far as specific description of any other kind of connection is concerned, I see none.

Q. When you say the wording is susceptible of some latitude, what do you mean? A. Well, take for example, the sentence beginning line 102, "The inner end of each of the bearings is supported by a transverse bridge or truss 21, joined respectively, centrally to the bearings and terminally to the edges of the portions 17 of the apron of the piston."

Q. But that is immediately preceded by this part, and I will read the entire quotation, beginning with line 97: "Alined bearings, 19, each of which has a suitable bore, 20, for the reception of a piston pin, are attached at their outer ends to the head sections at the upper edge of the openings 16, centrally thereof." Then follows the sentence, "The inner end of each of the bearings is supported by a transverse bridge or truss, 21, joined respectively, centrally to the bearings and terminally to the edges of the portions 17 of the apron of the piston." There is a very clear statement that you have a boss supported at its ends rather than in the center? A. That statement so indicates, yes.

Q. Do you find any statement, even in any claim—I am not asking you to interpret claims—do you find any statement in any claim that indicates that anything but end supports of a bearing are contemplated by the patentee?

Mr. Richey: I object to that; that is asking him to interpret the thing.

The Master: I will interpret it when the time comes. He may answer the question. Objection overruled, and you may have your exception.

Q. You can limit yourself to claims 1 and 3 because those are the only ones involved in this suit. I don't want you to interpret claims at all. A. Well, I don't know, such a phrase "the transverse bar adapted to support the inner end of said bearing" just what that would mean.

Q. Well, "alined bearings the outer ends of which are suspended from said head section within said opening, and bridges sustaining the inner ends of said bearings." Wherever language of such kind may occur, certainly describes a bearing supported at its ends rather than at the center?

Mr. Richey: Same objection.

The Master: Same ruling.

A. Well, it implies a structure which suspends the inner ends. I don't know whether it implies a junction at the inner ends or not.

Q. You want to make that distinction? A. I don't know.

Q. I mean you want to make that distinction in English that a thing might be suspended? A. Is suspended at the center. I don't think it says it is suspended at the ends. It says it suspends the inner ends; I think so.

Q. You say then that the boss which is supported intermediate its ends on a wall or a web or a bridge is the same structure as a boss supported at its ends at two points of suspension?

Mr. Richey: I object to that as immaterial. There is no such structure involved here.

The Master: That follows from his answer, I think. He may answer.

Q. I am comparing now, Dr. Jeffries, if you are in any doubt about it, the Plaintiffs' Exhibit 1 with the Schmiedeknecht figure 4? A. Well, I should say that that is pretty close to the Schmiedeknecht actual wording and drawing disclosures, inasmuch as you have the boss at its upper end even supported by this rib which comes out nearly to the outer end, but it is distinctly, on the inner end, supported by the web.

Q. You go still farther then and say that a structure which consists of a description which states that a part is supported at its ends, is supported at its ends because it is supported all the way along? A. No, even the Schmiedeknecht drawing, Fig. 4, doesn't show the web at the outer ends of the bosses; it shows an overhang of the boss beyond the webs. Now, I think there is no distinction there as to just how far the overhang must be, or whether there should be overhang or not.

Q. As far as you look at the structure then, the structures are the same whether the boss is supported intermediate its ends or at its ends; that is the way you view it? A. Well, the drawing, if you want to get down to fine hairs, is intermediate the ends, isn't it? That is, Schmiedeknecht drawing No. 4. It is intermediate its ends, if you want to split hairs.

Q. But you would consider then a structure like Defendants' Exhibit 1, in which the boss is supported almost at its middle, the same elemental structure as for instance shown in the Schmiedeknecht patent in which it is at least supported at spaced points? A. Well, I should say that that structure could well be interpreted as the Schmiedeknecht structure, not only as a structure but in combination with that total web and the opening in the skirt between the web and the skirt below the boss; that whole thing is shown in combination in Schmiedeknecht and it is shown in combination in Defendants' Exhibit 3-G.

Q. But you don't consider the Ray-Day, in which the web is connected at both ends, one end at the skirt and the other to the head, as embodying any of the improvements in the Schmiedeknecht patent? A. Well, I should think not. That doesn't appear to be the Schmiedeknecht structure to me.

Q. Now the Schmiedeknecht patent structure also has a groove running all the way around, an oil groove? A. It has a groove in the slotted metal running all the way around, that is true.

Q. Part of it don't run out in the air? A. No.

Q. Is there any difference in that respect, then, whether part runs out in the air or does not run out in the air? A. Yes.

Q. You think so? A. Yes.

Q. What difference does that make? A. Why, it makes a difference in the mode of operation of the piston, if part of the groove goes clear through, the heat conduction from the head and the skirt is minimized at those places, the temperature is lowered, and there is

also the distortion at the top of the skirt due to difference in temperature, and, broadly, the various functions which I have previously discussed in connection with those horizontal slots.

Q. But Schmiedeknecht indicates a number of holes, 15? A. Yes, oil holes.

Q. He don't say how far he wants to place those holes? A. No.

Q. He might place them close together? A. He probably has got a pretty fair indication of them in the drawings.

Q. They would restrict the heat slightly? A. A little, but uniformly, again, around the periphery.

Q. Schmiedeknecht doesn't say these holes should be around? A. No, he shows them around, however. There is clearly no indication of a separation between the head and the skirt in Schmiedeknecht.

Q. You say there is no separation because he don't describe it in the specification? A. He doesn't describe it and he doesn't show it in his drawings.

Q. But as a matter of fact there is some separation, would you say 10% from the drawings, the size of the holes? A. I don't know. Whatever he has there is old and the same kind of separation we find in practically all pistons as shown in these various exhibits, well known oil holes.

Q. You say those were well known oil holes before Schmiedeknecht, is that what you want to imply? A. Yes.

Q. And well known oil groove for the oil to run back into the piston? A. There was grooving, yes; that has been used a long time in piston construction.

Q. The difference between Schmiedeknecht and Plaintiffs' Exhibit 1 is that Plaintiffs' Exhibit 1 has a T-slot in one of its faces, that is one difference, isn't it? A. Yes, it is, a horizontal slot at the top of the skirt and a longitudinal slot through the thrust faces.

Q. And such a T-slot could be applied to Fig. 2 of Schmiedeknecht? A. Oh, one could make sufficient modifications of the Schmiedeknecht drawings to make this piston, yes, if he made a lot of changes in it and included the inventions of Maynard and Jardine.

Q. I am not asking you that at all, I am asking you whether it would be impossible to take the Schmiedeknecht Fig. 2 and put a T-slot on it with the horizontal of the T below the lowest ring land, and with the vertical

of this T extending to the end of the skirt? A. No, one could do that with a hack saw or in a lathe, that wouldn't be impossible, if you knew how to do it, and the material were machinable.

Q. And such an arrangement corresponds generally to Defendants' Exhibit BBB? A. No, it does not.

Q. What is the difference? A. One difference is that the Schmiedeknecht construction, slotted as shown, would not provide relief in the axis of the wrist pin at the top of the skirt, and the slotting would increase the temperature at those particular places, increase the expansion, and seizure would result.

Q. There is keystone relief provided in the Schmiedeknecht patent? A. Yes, but it is not in the right place for the flexible skirt piston.

Q. Isn't the relief in the zone of the wrist pin bosses? A. Yes, but that is not where the relief in such a piston is most needed. It is most needed at the very top of the skirt.

Q. And Mr. Schmiedeknecht didn't provide for that? A. He did not.

Q. Do you know whether the Schmiedeknecht device ever was in commercial use? A. No, I do not.

Q. Do you know that it has not been in commercial use? A. I don't know that it has not or I don't know that it has.

Q. Did you ever meet Mr. Schmiedeknecht? A. No.

(Short recess taken.)

Q. Taking up the Maynard patent, 1,655,968, Maynard really describes as his principal feature in the specification, the provision of an oil groove around the skirt, doesn't he? A. I can't say that is the principal feature. The piston is a combination of many features.

Q. Well, I am asking you about the specifications as you have read them. Do they stress, do the specifications stress this so-called continuous groove around the top of the piston? A. Among other things, yes.

Q. Well, would you say "among other things" when probably 90% of the specification is directed to that?

Mr. Richey: I object to counsel's testifying. He asked the witness about it and then testifies himself, and besides it is not correct.

The Master: Well, he may answer.

A. No, I merely say that is one of the features of the combination which makes up the total construction of the Maynard piston.

Q. Well, the specification states, beginning line 70, page 1: "With the construction as described, when the piston is in operation, the lubricant upon the wall of the cylinder is spread by the skirt portion of the piston and will be forced upward to the groove E at the upper end of the skirt. At no time is there a body of the oil adjacent to the piston rings and for this reason when the engine is upon suction stroke, any leakage past the ring cannot draw oil upward." Doesn't that describe exactly what takes place in the Schmiedeknecht patent structure with its oil groove? A. Well, the first sentence of what you read, five lines or such a matter, refer to the full skirt, I think, at the bottom of the piston, how that skirt spreads the oil, and then the next thing is the function of the oil groove.

Q. Well, you have both the skirt and oil groove, the skirt part 18, and the oil groove in the Schmiedeknecht patent? A. You have the skirt and the oil groove, that is true. The oil groove is not the same as it is in the Maynard patent, nor is the oil groove in the Maynard patent confined to its functioning in the prevention of oil pumping; it has other functions.

Q. Well, let's leave out all the other functions for a minute, let's get down to the matter of its function as the oil groove in the prevention of oil pumping. You have in the Maynard patent structure a groove which the patent at least says goes completely around the skirt at the bottom of the ring lands, the groove being shown at E, and you have at least a similar groove in the Schmiedeknecht patent which does go completely around and does not go out into thin air for half of its circumference? A. Insofar as the groove is concerned, that is true.

Q. Is there any advantage in having it go out into thin air for half of its circumference? A. In the oiling?

Q. Yes. A. I think that is essentially a matter of whether the oil can get away to the inside of the cylinder, which you can do in the oil groove of Schmiedeknecht or through the openings in Maynard, the wide opening.

Q. But there is no essential difference between the two constructions as far as the spreading of the oil on the cylinder or preventing oil pumping? A. Well, I can't say that; the spreading of the oil would be about the same in both constructions.

Q. And the oil in both constructions would flow back into the inside of the piston through the oil groove? A. It should if everything functions properly. Of course

there is much more space for it to flow back in the Maynard construction than there is in the Schmiedeknecht construction.

Q. The patent further states: "As a further safeguard, the cylindrical portion below the lowermost of the ring C is cut away to provide a further clearance, as indicated at J, this clearance being sufficient to prevent the bridging of the oil thereacross." You don't find that in the Schmiedeknecht patent, do you? A. No.

Q. But can you tell me, as one skilled in the art at that time, whether that particular feature was a common practice? A. I don't know whether it was or not.

Q. You don't know whether that was done with pistons in 1920 or '21? A. No.

Q. The specification then proceeds: "Thus on each downward stroke of the piston, the lowermost ring will scrape all surplus oil from the surface of the cylinder and in the upward stroke the oil thus accumulated will pass through the groove E and downward. Any oil accumulating in the recesses H will follow down the webs F and there is no chance at any point for the accumulation of oil adjacent to the rings." Doesn't that take place in the Schmiedeknecht patent? A. I should say, broadly speaking, yes.

Q. We have in both, of course, an open space, the open spaces 16 and H of Schmiedeknecht and Maynard correspond? A. In the Maynard drawings, yes.

Q. Would you say that the Maynard patent structure is a slipper piston? A. No, I wouldn't call it a slipper piston.

Q. But you said it was like the Jardine patent structure? A. From the boss up, approximately; I said that.

Q. And from the boss down it is like Schmiedeknecht? A. More like Schmiedeknecht, that is true, with the exception of course of the other features in Maynard not described in Schmiedeknecht.

Q. Maynard, then, really, is a hybrid of Schmiedeknecht and Jardine, isn't it? A. I wouldn't call it that. It is a commercially successful piston, combining a number of features.

Q. Well, the top corresponds to Jardine and the bottom corresponds to Schmiedeknecht; it really amounts to putting the part 18 of Schmiedeknecht onto the Jardine slipper piston? A. Well, that wouldn't make a particularly good piston, just that.

Q. Why wouldn't it make a good piston? A. Because all these things have to function together or in com-

bination in order to make a successful piston. And one of the features of the Maynard piston is flexibility, and the flexibility of the skirt portion and the webs cooperate to produce the Maynard effect. So that the bottom of the Maynard piston must cooperate with the top of the Maynard piston, to make it a commercially successful piston.

Q. Would you say, then, that the skirt of the Maynard is more flexible than the skirt of Jardine? A. Well, there is more skirt in the Maynard, and there is more requirement for flexibility, especially at the bottom of the skirt, because there is no relief at the bottom of the skirt, so that the requirement for flexibility is different in Maynard from what it is in Jardine, at the bottom of the skirt.

Q. You would contend, then, that the flexibility must be at bottom rather than at the top, in any piston? A. It must be wherever flexibility is required.

Q. Well, I am asking you, you say it should be at the bottom, the greater flexibility at the bottom than at the top in the Maynard piston? A. Yes, in the Maynard piston there is no other provision for compensating for clearance except the bottom of the skirt, except the flexibility.

Q. And the flexibility at the top is not so important? A. Oh, it is very important, but there are other features combining to compensate for the extra expansion at the top in the Maynard piston.

Q. But you don't have very much flexibility in the top at all, do you, in the Maynard piston? A. Yes, you have enough to make the difference practically between success and failure of the piston. That is, if the slot is not cut through on Maynard at the top of the skirt, there is not sufficient provision to take care of the excessive clearance.

Q. But you do not have such flexibility at the top of the Maynard skirt as you have at the top of the Jardine skirt? A. Well, that depends, I think, on the construction, depends on the thickness of the various parts of the piston.

Q. Well, as a matter of fact, slots 29 and 29a of Jardine do provide for definite flexibility of the skirt, don't they? A. Yes.

Q. And you don't have anything like that in the Maynard patent, do you? A. Yes, the same.

Q. Where do you have it? A. Well, the horizontal slot E in Fig. 1.

Q. Will you explain to the Court how it is physically possible to slot the skirt of either Exhibit 1 or Exhibit 17 at the top?

Mr. Richey: You mean Exhibit 1 when the—

Mr. Bruninga: When the slot is cut all the way through.

A. Yes. The horizontal slot which I am indicating with my pencil is the same as E in Fig. 1 of the Maynard drawing. The vertical slot which I am indicating with my pencil is the slot at I in the Maynard drawing. The skirt itself is made of metal which is quite thin, and the cylinder pressure against the face of the piston, say, in a direction perpendicular to I, will flex the sides of the skirt inwardly, which will compensate, in a measure, for extra expansion. There is also some flexibility of the skirt by virtue of the general flexing of the entire skirt as the result of cylinder wall pressure. This is sufficient at the bottom of the skirt to be readily seen with the pressure exerted with one hand.

Q. But the flexing at the top can only be the initial flexing of the cylindrical parts? A. Mostly, I won't say only.

Q. You want this Court to understand, then, that it is your opinion that these so-called webs flex? A. Some, yes.

Q. And even with the web length of one-eighth of an inch or maybe a sixty-fourth of an inch? A. The lever arm is not the particular length of the web, but it is the distance between the straight line connecting the two ends of the slot and the outer diameter of the skirt. I may say in that connection, however, that the compensation for the excessive expansion is, as a practical matter, taken care of. As to how much that is due to mechanical expansion and the distortion resulting therefrom, as to how much is due to the lowering of the temperature of the skirt itself at the thrust faces, as to how much is due to distortion due to mechanical pressure of the cylinder walls against the pistons, and the effective pushing out of the piston at points where it is relieved, and as to how much is due to the actual flexing due to the slots, I cannot say. Neither can our automotive engineers at the Aluminum Company of America who have been working with this problem for many years. But all of those things in combination provide a piston with low enough clearance at the top of the skirt so that

it doesn't slap when the piston is cold and it doesn't seize when the piston is hot.

Q. Let's leave out the question of the great commercial utility of this piston and let's get down to facts. The so-called webs in this piston in Exhibit 17 do not flex like contemplated in the Jardine patent, do they, at the top? A. Not as much as with the webs at the top of the construction shown in Jardine Figs. 6 and 7.

Q. Would you say even 1% as much? A. Oh, yes. I told you a while ago I cannot say what percentage is contributed by each one of these elements, I don't believe you can, either.

Q. I don't claim to be an expert, Doctor. The flexure at the bottom is due to the twisting of the whole structure, isn't that right, from the top to the bottom? The flexing of the bottom, that can be accomplished by simply pressing the skirt together with your thumb? A. Yes, that is true generally. The whole skirt contributes to that flexibility.

Q. And that same sort of an action takes place if you take BBB, which unfortunately is not slotted through, but which I am perfectly willing for you to have slotted through at lunch time or at any other time in order to suit yourself. A. That would be true of Defendants' Exhibit BBB.

Q. And there are no webs there to flex? A. There are the equivalent of webs.

Q. That is, the inside connectors? A. Yes, in effect, and the relieved portion around the bosses on that construction will function the same as the webs in the Maynard construction.

Q. You consider Exhibit BBB an equivalent generally of the Maynard patent construction? A. In part it is. It is an impairment of the Maynard patent construction.

Q. But nevertheless in your opinion it embodies the improvements of the Maynard patent? A. It will function the same as the Maynard piston and it will produce approximately the same results, but I believe with some impairment.

Q. Now, Doctor, I wish you would take a clamping device that I hand you and which I will mark for identification as Defendants' Exhibit 3-I. Will you demonstrate to the Court just how you flex those webs on Exhibit 17, particularly at the top, to close the slot at the top? A. I don't anticipate I can close the slot at the top with this device.

Q. Well, you can get a terrible leverage with that device, can't you? A. Considerable, yes.

Q. And you can get about as much pressure with that device as you ordinarily want to have in an automobile cylinder in which that piston operates? A. Possibly. This piston is cold, it is not in operating condition, no need for any flexing when the piston is at this temperature, no possibility of any distortion effect when a piston is all at the same temperature.

Q. But you don't think even with that device you can even appreciably close the slot at the top of Exhibit 17? A. Appreciably, well, I don't know, but I will say the difference of a thousandth of an inch in effective diameter is the difference between success and failure in piston improvement, and I would question whether you could see a thousandth of an inch movement with the naked eye.

Q. You think you cannot see any movement whatsoever? A. I don't know, I will try it. (Witness does so.) Oh, I can see lots of movement. You see about as much movement as with the hand operating the bottom of the skirt.

Q. Doctor, what you really did was to place it with the compressor handle in the line of the wrist pin bosses? A. Doesn't that compress circumferentially? (Showing to counsel.)

Q. But place it now with the compressor in the line of the slot, and see whether you can compress it? A. (Witness complies.) Yes, it is about the same. I can almost close the thing.

Q. You can almost close it? A. Yes. I should say that that is easily ten times as much as it would be called upon to flex in the motor.

Q. You think that that pressure you applied there is just about the pressure you would encounter in an automobile cylinder? A. No, I think that is probably ten times as much as would be applied in those particular directions.

Q. You think the pressure in the automobile is ten times? A. No, I think the pressure I applied there. I just mention that the degree of flexing is probably ten times as much as that piston would ever be called upon to flex in a motor.

Q. As a matter of fact, in the piston Exhibit 17 or Exhibit 1, the expansion is compensated for by this Keystone relief, I mean this Keystone structure on the non-thrust side? A. In part only.

Q. But that is the purpose of that tapered relief? A. The purpose of the tapered relief is to put less of a burden on the slotting and take care of more of the expansion in the ways mentioned.

Q. And in some of the pistons, this being a Ford piston, in some of the pistons that relief is accentuated more, as shown in Exhibit 17? A. Yes, it is a little, and in some there is no taper at all. In some the section there is rectangular.

Q. You said some of these pistons have been operated without this Keystone relief, some of these Maynard patent pistons? A. Yes.

Q. What company operated them? A. The Willys-Overland and the Oakland Company.

Q. When did they operate?

Mr. Richey: Just a minute, have you finished?

A. I heard your opening statement and I spent only about a half hour over to the Harvard Avenue plant of the United States Aluminum Company and looked up some drawings just to see whether I could find pistons that had been made and were commercial with the construction which you said was not commercial. So in that time I found the Overland piston and the Oakland piston which had not only been made but were production pistons, and I found a Packard piston which I do not know whether it had gone into production or not, but I made no attempt at an exhaustive search.

Q. You found actual pistons or drawings of pistons? A. I found the actual piston in the case of the Willys-Overland, and drawings in the case of the other two.

Q. Will you get that actual piston? A. I will try to, yes, sir.

Mr. Richey: You have asked for the piston or drawing?

Mr. Bruninga: The piston.

Mr. Richey: I think there would be a better chance of getting the drawing, if you want some evidence.

Mr. Bruninga: The drawing don't mean anything to me. Anybody can make a drawing. I would like to see the piston.

The Master: I think you may have the piston.

Q. Doctor, all of this type pistons that are used today have this Keystone relief? A. I am not sure, but I suspect so.

Q. Now, the pressure that you apply, that you said, that you indicated would close this slot at the top partially in Exhibit 17, how much of that was due to the bending of the segmental parts from the ends of the slot in? A. I don't know.

Q. You wouldn't, as an engineer, say, Doctor, that the webs from the center of the head to the end of the web, really flexed at the top in Exhibit 17? A. Not a whole lot, but they flex.

Q. Well, it is microscopic, isn't it? A. Well, I don't know why you insist on that because I have said that there are a number of things that contribute to that compensation for expansion, and I can't say what percentage this element contributes and what percentage another element contributes, but I have said that the webs flexed, and I have said that the skirt flexes.

Q. But you don't want to say whether it is microscopic or appreciable? A. Oh, I think it is not microscopic.

Q. Now, Doctor, the flexure of the skirt should be the greatest at the top, shouldn't it? A. Flexure—not necessarily. The compensation for excessive expansion must be greatest at the top, but the flexure need not be greatest at the top.

Q. Well, it is more desirable to have a flexure at the top than at the bottom, isn't that right? A. If you depend entirely on flexure for the compensation for excessive expansion, that is true, but only in that case.

Q. Well, as a matter of fact it is not really necessary to run this slot in Exhibit 17 down to the bottom of the skirt, is it? A. That is according to how closely you wish to work on the bottom of the piston, as far as fit is concerned, and also depends on the way the exterior of the skirt is ground. That is quite a broad question in itself, it is also one which involves economic features. This Maynard piston can be put into a machine and machined into two cylindrical portions, the head portion with a considerable clearance, and the skirt portion with small clearance, and then these slots can be put in and the piston can be put in the motor. There are other ways of taking care of the expansion at different places, by oval grinding and taper grinding and things of that sort, which increase the cost of a piston to the motor car manufacturer.

Q. Then the Maynard type pistons with which you have been familiar haven't been tapered, taper ground or taper finished at all, have they; they have been plain

cylindrical surface? A. Mostly, yes, that is true. If one is interested in a very fine fit, the other features can be incorporated. Some of the companies do that.

Q. But in your opinion in order to incorporate this improvement of the Maynard patent, is it, even on cylindrical surfacing, necessary to extend the slot to the bottom of the skirt? A. That depends again on the degree of fit, that is closeness of fit. If the slot is extended clear through it makes the fitting much easier.

Q. Now, in this piston like Exhibit 17, for instance, as the piston heats up, the whole structure, particularly in the region of the wrist pin bosses, tends to expand along the lines of the wrist pin bosses, doesn't it? A. Yes, it expands in all directions, but it expands more in the direction of the wrist pin bosses than in other directions, that is the slotted skirt type.

Q. And the effect of that is to throw these bearing faces against the cylinder, press them out against the cylinder, isn't that right? A. On the slotted side, that is true.

Q. And on the unslotted side also? A. No, on the unslotted side it tends to reduce the effective diameter of the piston.

Q. Pulls it in? A. Yes.

Q. Why is it, then, that this relief, this Keystone relief is put on the unslotted side? A. To provide some place for the highly expanded metal to go in the cylinder barrel. If there were no relief there would be no place for that extra expansion to go.

Q. But on the slotted side the relief is put in there in order to take care of the pulling out at the top of the structure? A. It serves the same general purpose as the relief does on the main thrust faces.

Q. The relief on the non-thrust, the split side, is for the same purpose then as on the other side? A. That is it serves that purpose. A piston at any given instant can be regarded as a rigid structure. Now, at another instant the shape of it may be a little different due to flexing, but insofar as it is at any instant a fairly rigid structure, the same rules apply on one face as on the other face.

Q. The Keystone is really the reverse in the Jardine patent? A. Yes, it is.

Q. Why is that? A. Why, I don't know just why, except that perhaps the particular web construction there in the Jardine requires a fairly wide distance between

the webs where they join onto the head flange, for economical manufacture, and for ease of removal of the core sections inside, and the width need not be so great at the bottom. And that perhaps is responsible for the structure shown there.

Q. Do you know Mr. Jardine? A. Yes.

Q. He is an engineer? A. Yes.

Q. And he would have some definite purpose for a thing like that, wouldn't he, a construction like that? A. Oh, possibly. The main purpose would be that such a piston would work in a motor.

Q. The Chrysler Company has used pistons like Exhibits 1 and 17, haven't they? A. Yes, like Exhibit 17.

Q. Do you know who furnished them? A. The Aluminum Company of America has furnished them, and I think the other suppliers have also provided the same piston.

Q. The Plymouth is one of the Chrysler cars? A. Yes.

Q. Do you know whether it is still used in the Plymouth? A. No, it is not.

Q. What type is used? A. A piston currently known as the T-slot piston.

Q. It is not a structure like shown in the Maynard patent, then, or in Exhibit 17? A. No, it is not the same structure.

Q. But Chrysler has a perfect right to use that particular structure, as you understand the situation?

Mr. Richey: I object to that. He is asking this man's conclusion about it.

The Master: He may answer if he knows. He has qualified as an expert on this.

Mr. Richey: He is not an expert on other patents not involved in this case.

The Master: He is an expert on pistons. This is a question of a piston on a car. He can give his opinion.

A. I think Chrysler pays a royalty on these pistons, all the pistons, as far as I know.

Q. Does Chrysler pay a royalty under the Maynard patent, is that your understanding? A. I suspect so; I am not sure.

Q. Did you know that Chrysler is a party to this suit, has been made a party to this suit or attempted to

be made a party to this suit, without its consent, and also as the owner of a half interest in the patents in suit? A. Half interest of one of the patents, yes.

Q. But Chrysler, as you understand it then, has abandoned the use of this Maynard patent construction in the Plymouth car? A. It has in the new Plymouth car insofar as the typical Maynard construction is concerned. That doesn't mean that the Maynard patent may not infringe certain other patents that the Cleveland Trust Company holds.

Q. Now, how about the Ford 8; what type piston is that using, the exact construction? A. Oh, not the exact Maynard construction.

Q. Again it is a T-slot, isn't it? A. Well, I wasn't aware that that was a T-slot, but I thought that was a piston that was slotted, in which the vertical slot at least was completed.

Q. This is the piston being used in the Ford 8? A. Yes. The slot is completed, however.

Q. Oh, yes, that is what I understand.

Mr. Bruninga: The piston is marked for identification Exhibit 3-J.

Q. In other words, as I understand it, Ford abandoned what you call the typical Maynard patent structure since he put out the new eight cylinder car? A. For the eights only. He continued to use that in the new four. That is current in the new four.

Q. It is current in the new Ford? A. In the new four, as well as Model A. On 1932 Ford put out two new models, an eight and a four. This is the piston which he used in the eight, Defendants' Exhibit 3-J, but he continued to use the piston of the typical Maynard design in the new four, the 1932 model.

Q. Now, do you find any description whatsoever in the Maynard patent of this Keystone relief shown in Exhibits 1 and 17? A. Not what you call a Keystone in the wording, but the drawing shows that construction.

Q. And you would gather that from the Fig. 2 view of the patent? A. Yes, and Fig. 1.

Q. You don't consider that essential at all, do you? A. Well, I think it is preferable but it is not absolutely necessary. One should provide the necessary clearance by machining the vertical connection there, or rectangular connection, it is worded.

Q. Do you know Mr. Maynard? A. No.

Q. Never met him? A. No.

Q. The Maynard patent states, at page 1, line 12: "To avoid sticking or freezing of this skirt, due to expansion, certain constructions of pistons have provided the skirt with a longitudinal slot therein to compensate for expansion, but there is one serious difficulty with all such constructions, viz., the tendency for the lubricating oil to work up beyond the skirt and rings and into the explosion chamber." Is it correct that at the time that Maynard applied for his patent that was the practice? A. At the time he applied there wasn't much practice on it, by the time he applied; but at that time I feel quite certain that he had the Jardine piston in front of him.

Q. You say he had the Jardine piston in front of him? A. I should think so.

Q. You know that, or is that just opinion? A. Well, the Jardine piston had been tested out in motors and was about ready to be adopted, I think, when this Maynard development came along.

Q. Was that Jardine piston sent over to Maxwell where Mr. Maynard was at that time? A. Well I don't know about that, but the piston was in the Aluminum Company laboratory, I think, at the time this application was filed.

Q. You have reason to believe Mr. Maynard saw that Jardine piston? A. Well, I believe it was. I was in the laboratory a good deal about that time and this was really a situation which gave us a considerable amount of concern, that is, the proper utilization of aluminum pistons in motors, and I recall the tests made on Jardine pistons and that it was thought that the Jardine piston would probably be adopted in the Maxwell production, and then the Maynard piston was forthcoming and the Maynard piston was the one that was adopted in the car.

Q. Was the Jardine piston tested out in the Maxwell car? A. It was tested out, I think in the Maxwell engine in our plant, whether it was tested in Maxwell cars or not, I am not sure.

Q. Maynard was chief engineer of Maxwell? A. He was an engineer there, according to the best of my knowledge; whether he was chief engineer or not I don't know.

Q. At the time the Jardine piston was being tested out? A. Yes, I think so.

Q. But did you have a Maxwell at the Aluminum Company plant to try out this Jardine piston in? A. I

don't recall we had a car, I think we had a Maxwell motor.

Q. And that particular Jardine piston was of the construction shown in the Jardine patent? A. As I recall it, substantially.

Q. Well, it had what you might say a slot across the top below the ring land and a vertical slot connecting with it to form a T? A. Yes.

Q. Then instead of taking the Jardine piston, the Maynard type piston was put into the Maxwell cars? A. Yes.

Q. So as you understand it, Mr. Maynard at the time he proceeded with the development was familiar with the Jardine split slipper piston? A. I think it is quite likely. I cannot say for sure; I think it is quite likely.

Q. Well, Mr. Maynard is dead, isn't he? A. I don't know.

Q. Mr. Jardine is alive, isn't he? A. Yes.

Q. Isn't he in the city? A. I think so. He was, earlier in the week.

Q. Is he still in the employ of Aluminum Company of America? A. Yes.

(Noon recess.)

(1:30 P. M., Friday, January 20th, 1933, hearing resumed.)

The Witness: May I make a statement here? Yesterday you asked me for a Silv-o-lite piston, and this morning for a Willys-Overland piston to which I referred in my testimony. I haven't been able to locate a Silv-o-lite piston but I have a photograph here on a piece of paper which I recognize as that of a Silv-o-lite piston.

Q. You saw that Silv-o-lite piston in San Francisco, didn't you? A. Yes.

Q. In fact they were some of the defendant's exhibits there at the trial? A. Yes.

Q. Just like shown on this photograph? A. Yes.

Q. Now, the main difference is that the bottom of the skirt, taking for instance Exhibit 1, is closed, that is the space between the web and the circumferential part is closed by metal, isn't that right? A. That is correct.

Q. Do you remember any other differences? A. Yes, there were downwardly extending recesses at the ends or the open parts of the horizontal slots, and also a

somewhat different configuration of the skirt portion itself.

Q. Can you tell me whether this is a Silv-o-lite piston, the exhibit I am handing you? A. Yes.

Q. I don't mean whether it is actually made by that company or whether it is the same piston? A. Yes, it is.

Mr. Bruninga: The piston is marked for identification Defendants' Exhibit 3-K.

The circular with the photograph of the piston is also marked for identification Defendants' Exhibit 3-L.

Q. And I believe you stated on your direct examination that those particular people were making this piston without authorization? A. I think so, yes.

Q. You will notice, particularly in this Exhibit 3-K, that there is no Keystone relief on the unsplit side and there is a distinct Keystone relief on the split side. Can you explain that from your knowledge as an engineer in this piston art? A. No, I don't know exactly what that difference has been put in there for, although the extra relief on the side which is to be slotted does make the skirt thinner and hence more flexible on the slotted side.

Q. It is a fact, isn't it, that all of these pistons that are split are furnished to the ultimate user, for instance to the garage man, in a partially split condition and that later your split is intended to be completed? A. That is usually the case, at any rate.

Q. Now, there are very heavy connections in this piston between the head and the web. A. It merely looks so from the outside, I think. There is an inside configuration which corresponds to the outside configuration, making the connection lighter than it appears.

Q. In order to obtain your opinion as to what the teachings of the patent in suit cover, can you tell me from looking at this piston whether it embodies any of the improvements in the Maynard patent in suit?

Mr. Richey: It seems to me that is going pretty far afield. Here is a device which is not charged to infringe here.

Mr. Bruninga: Does your Honor want to hear me on that, because I believe I can settle all this sort of questions? There is a definite principle of law established in practically every circuit and also in this circuit, to this effect, that if a plaintiff coming into court with a patent construes that patent to the

breaking point, the court is warranted in taking him at his word and holding that patent invalid. We are entitled to a construction of this patent from the court. I am not trying to get any opinion as to whether this infringes or not, but in order to determine just what the metes and bounds of these patents are we have a man before us who claims to be an expert and who can tell us whether they embody the improvements of the various patents. Now, that has been the purpose right along, for instance in my entire line of examination, for instance in connection with the Spillman & Moores patent and other of that type, not going into the prior art, but getting this man's ideas of it. He is a man skilled in the art and he is the best one to tell us on behalf of the plaintiff.

Mr. Richey: It is not any different than in any other suit. There are certain definite issues. The issues are whether certain piston charged to infringe come within the patents. Manifestly under those circumstances neither party has a right to go along and inquire about a lot of things not before the Court. That is not any different from any other suit. It makes it endless. On his theory he could bring a hundred different pistons in here and ask this man's opinion as to whether they come within the patent. That is what he is starting out to do.

Mr. Brunings: There is just another reason, your Honor, it has been represented to this Court that there is a certain party on the Coast who is making this stuff, probably without a license from the owners of the patent, and the plaintiff has tried to show to this Court that practically everybody has run to cover under these patents, that practically every piston made in this country today is made under these patents in suit. I didn't bring up the United Engine & Machine Company, this witness brought it up first in his statement that there were two parties on the Coast that were making pistons, and I believe he said, in defiance of the patents in suit. We can certainly inquire if they take the position that this is in defiance of the patents in suit, what those structures are.

The Master: I think he may answer. You don't need to spend a great deal of time on it. He may answer and you may have your exception, Mr. Richey.

A. I think the Silv-o-lite piston, when the slot is completed, embodies a number of the elements of the Maynard construction. It will function like the Maynard piston and it will produce substantially the result of the Maynard piston.

Q. Well, the answer to my question if it embodies any of the improvements of the Maynard patent, is that it embodies some of the improvements of the Maynard patent? A. I think it does.

Q. Would you say the same with reference to the Moores patent in suit? A. I think so.

Q. And the same with reference to Jardine? A. Yes.

Q. The same with reference to Gulick? A. Yes.

Q. And the same with reference to Schmiedeknecht? A. I am not so sure about the Schmiedeknecht on account of the closing of the webs below the bosses.

Q. In other words, when that opening is closed you don't have a web anymore, is that right? A. Well, when the opening is closed you don't have the cut-away part of the skirt below the web; it has been cut through.

Q. Now, before the recess we were talking about pistons— A. May I complete my statement?

Q. Oh, yes, certainly. A. You asked for a sample of the Willys-Overland piston showing the skirt portion at the top with the straight up and down section as opposed to the Keystone type of section. I was able to locate a rough casting of the Willys-Overland piston and also a rough casting of the Oakland piston with that construction. These are not completed pistons but when completed they have the horizontal slotting and one face has the vertical slot. I produce the Oakland rough piston casting and the Willys-Overland rough piston casting.

Mr. Bruninga: The castings are marked for identification, the Willys-Overland as Defendants' Exhibit 3-M, and the Oakland as Defendants' Exhibit 3-N.

Q. And these do not show the Keystone relief? A. No.

Q. Do you know, however, how they looked when they were finished, finally finished up? A. I don't recall that I have seen either of those in the finished shape, at least to examine them carefully.

Q. But it would be a simple matter to run a file along there in both cases to make a Keystone relief? A.

Machining could be so designed so as to give extra relief if necessary or desired.

Q. Just before lunch recess we were talking about the necessity of extending a slot to the end of the skirt, and at that time I was looking around for a piston that might illustrate it, that is, a sample so the Court could know, have a more intelligent understanding of what we were talking about. I show you a piston which I mark for identification Defendants' Exhibit 3-O. That structure was about what we had in mind, wasn't it, when we talked about extending the slot not to the end of the skirt?

Mr. Richey: I make objection to this. It is immaterial, going far afield; no such structure as that before the Court.

The Court: He may answer.

A. (After examining the exhibit.) Insofar as the through slots are concerned, I think you mentioned something about a slot which was not cut through the bottom, this piston has such a slot in it.

Q. That is an example of such an arrangement in which there is a T-slot and the vertical don't go to the end of the skirt? A. That is correct.

Q. Do you know whether or not Chrysler uses that particular piston in its Plymouth?

Mr. Richey: Same objection. It certainly is immaterial to any issue in this case whether Chrysler uses that or not.

The Master: Same ruling.

A. I think they do use a piston similar to this in the Plymouth.

Q. Now, in your direct examination you explained the utility of the Maynard piston in preventing oil pumping. I don't think I got a clear picture of that. Can you elaborate that a little bit, how oil pumping is prevented with this Maynard patent construction? A. Yes, I would compare it with the construction shown in Jardine, Figs. 6 and 7. When the oil is sprayed or splashed or thrown against the cylinder walls in the Jardine construction, it is not spread evenly over the wall of the cylinder, especially in the parts not traversed by the rings, and that causes an uneven distribution of the oil in the cylinder which makes it easier for the oil to by-pass the rings and get up into the combustion chamber. One function of the large bearing at the bottom of the skirt in Maynard

is to spread that oil evenly on the cylinder wall, which makes the accumulation of oil at the ring groove sections more even and thus militates against the oil passing the ring section up into the combustion chamber.

Q. Isn't that the function that is also performed by the ring I in Exhibit 14? A. Yes, it is.

Q. And that is known as an oil ring? A. Yes.

Q. And that is quite ancient? A. I think it is.

Q. Anyway it goes back of the Maynard patent? A. Well, I am quite sure that it does, yes, according to my knowledge it does.

Q. So what Maynard did was to add an oil wiper to the Jardine piston, is that right? A. That is one of the things that he did. He made it integral with the rest of the piston, for one thing, and he produced a better guide for another thing.

Q. And that is exactly what we had in Schmiedeknecht, Schmiedeknecht does the same thing, doesn't he? A. Insofar as the oil distribution is concerned, the Schmiedeknecht skirt bottom should do the same thing. It is not a flexing skirt, however.

Q. Because it is not split? A. Well, it is not a flexible skirt.

Q. Well, that is because Schmiedeknecht's is not split? A. That is a true statement, I merely make the mention that it is not a flexible skirt, whereas the Maynard skirt bottom is a flexible skirt bottom.

Q. But you have noted the Maynard patent specifically stated the splitting of the skirt is known to him? A. Noted what?

Q. That the splitting of the skirt has been previously practiced, when he says in his specification, at page 1, line 13: "To avoid sticking or freezing of this skirt, due to expansion, certain constructions of pistons have provided the skirt with a longitudinal slot therein to compensate for expansion, but there is one serious difficulty with all such constructions, viz, the tendency for the lubricating oil to work up beyond the skirt and rings and into the explosion chamber." Did you have that in mind, that Maynard knew as a matter of fact that splitting of the skirt had been resorted to, when you gave your answer Schmiedeknecht didn't split his skirt? A. I think that is a fact, at least that is stated in the specification.

Q. Is it your position that the split in these pistons should be on the non-thrust side? A. That is best, yes.

Q. And by the thrust side we mean the side of the piston that is forced against the cylinder during the explosion stroke? A. Yes.

Q. Now, that is not universally the practice, though, is it, to place those splits on the non-thrust side? A. They have been placed on either side and on both sides, but it is the common practice, I think, to put the flexible, vertical slot, at any rate, on the side of minimum thrust.

Q. And that is the universal practice even today? A. Well, I don't know of any other construction at the moment.

Q. Do you remember the Packard, where the Packard places the split of the piston? A. No.

Q. You don't know then that they place it on the thrust side? A. No.

Q. Now, in this Jardine patent the statement is made, last paragraph on page 2 of the specification: "While I have shown my invention applied to the slipper type of piston as distinguished from the skirt type it is to be understood that the invention is essentially applicable to other forms of construction, the scope of the invention being indicated by the appended claims." Is it your understanding from that that this feature may be applied to the ordinary skirt piston the same all the way around, the Jardine patent feature? A. Well, I think certainly the Jardine features can be so applied, yes.

Q. And that would mean continuing the circumference of the slippers in Fig. 8, for instance, so as to make a skirt? A. No, at least unless relief were provided in that region, it would not embody the Jardine disclosures, as I read them.

Q. Now, in the Jardine construction both slippers are slotted, are they not? A. They are so shown, yes, in the drawings.

Q. In fact the specification states distinctly, page 1, line 75: "The segments of each pair are separated from one another by a longitudinally extending slot 12, said slot preferably being inclined or spirally arranged as shown"? A. That is correct.

Q. He don't point out any particular virtue of only splitting one of the slippers? A. I think not.

Q. In fact, Jardine describes in his specification that the larger slipper 30, Fig. 8, for instance, is on the thrust side? A. I think so, on the side of maximum thrust.

Q. And that side is split? A. Yes.

Q. As well as the non-thrust side? A. Yes.

Q. Now, Mr. Jardine in his patent refers to a proportioning of web thicknesses, page 2, line 34, in order to permit flexing of those webs. There has to be some proportioning, as he describes, in order to secure that flexing, isn't that right? A. Yes.

Q. The proportioning of thickness cannot be ignored at all if you desire a flexible web? A. No.

Q. And Mr. Jardine also described the webs as being definitely separated from the head by slots 29 and 29a in Fig. 6, and that is also necessary in order to really get a springing of those webs, flexing of those webs? A. At the top, yes.

Q. Now, there are two constructions illustrated in the Jardine patent. In one construction, as shown in Fig. 2, for instance, these webs extend directly from the head, isn't that right? A. Yes.

Q. Somewhat comparable in that respect with the direct connection in the Spillman & Mooers patent? Oh, I don't mean as to details but I mean just as to that feature? A. Yes, more particularly, however, in the Gulick.

Q. Well, I expected you to say that. Now, in the construction shown in Fig. 7 the webs are connected with the ring flange? A. Yes.

Q. He really describes those as equivalent constructions, doesn't he? A. I am not sure that he does. I think he describes them as two separate constructions. He describes Figs. 6 to 9 as a modified form of piston.

Q. Now, in both constructions there is a cross web or rib, whatever you may call it, 27, Fig. 7, or 9, Fig. 1, which connects up with that web? A. Yes.

Q. Now, the Jardine patent says at page 2, line 76: "It will be seen that this last form of construction is based upon the same principles as the first form and further detailed description is therefore unnecessary. The main difference between the last form of construction and that first described resides in the webs 35 which support the wrist pin bosses and the guide portions, said walls being joined to the head structure at the lower edge of the ring flange 23 rather than springing from the head disc as in the first form of construction." Now, when he says it is based upon the same principle, isn't it your understanding, then, he considers those two constructions equivalent, whether he brings the webs right

from the head with the cross rib or brings them from the ring flange with the cross rib? A. Well, I don't think that is a justifiable conclusion necessarily. At any rate certain of the features would operate substantially the same in the two constructions. The main advantage over 6 and 7, as I see it, is that there is a truly single-walled construction in which the various parts cooperate to make for both the strength portions and the bearing portions and the flexible portions of the piston, and that piston can be manufactured in permanent molds, readily, whereas the other one cannot be readily manufactured in a permanent mold.

Q. Another point is that Fig. 7 looks somewhat more like the Maynard patent construction, while the other figure, Fig. 1, looks somewhat more like the Spillman & Mooers, as far as whether the attachment is from the ring flange or from the head itself? A. Well, I think it may be assumed that having gone to the trouble of showing the two forms, that it was considered that they were sufficiently different to warrant making the drawing and description.

Q. And also that they were sufficiently similar to include in the same patent? A. I think so.

Q. I believe you called attention to the ease of casting and particularly this nice little rounded fillet in the neighborhood of 28 and 28a, Fig. 8. That is made rounded like that rather than overhanging in order to get the mold half away from the piston? A. Yes, it is.

Q. You don't consider that that required a lot of ingenuity, do you? A. I don't think that that is my province. A lot of these things that seem simple, seem to have escaped the imagination or the efforts of the best brains of the world for many years. So it isn't for me to say just what required ingenuity and what didn't, after the thing is twelve years or more old.

Q. You would consider then that it requires ingenuity of a leading brain? A. Oh, I am not making any statement one way or the other; I don't see why I should. I wouldn't like to undertake to answer all such questions as of twelve years or more ago, however.

Q. You had experience twelve years ago in permanent mold practice? A. Yes.

Q. And you knew it was as common as could be to provide fillets for outer parts in molds? A. I knew it was necessary to provide either a structure which is simple enough to be molded or a mold which is complicated enough to take care of a complicated structure.

Q. And if the thing would overhang, you couldn't get it out; you would just be helpless? A. No, I don't take that position, either, Mr. Bruninga. I simply don't care to pick these things which produced results which engineers long sought, try to pick them to pieces and destroy them by calling attention to the things which may now look simple and easy, that is all.

Q. You would say then from what I previously read from the patent and what you understand this patent is, it contemplated a continuous skirt if properly relieved? A. Well, I didn't say that it contemplated that necessarily; but it may include it, I don't know. It includes some features of it, at any rate. Apparently this Jardine disclosure is the first real construction which showed how to produce a single walled piston made of aluminum alloy which could be given a sufficiently small clearance at the upper end of the skirt to eliminate slap and yet have sufficient clearance to operate when the motor is hot. That is a very broad statement and that is what I conceive to be the Jardine disclosure.

Q. By a "single wall" do you mean something you could readily get the cores and molds away from? A. No, I mean a single wall, and I mean just that. The Gulick construction is shown as a double wall, and this Spillman & Moores is a double wall construction, and the Ray Day is a double wall construction. It was shown how to get the flexibility in a double-walled construction, but I don't think it was shown how to get it in a single walled construction, prior to Jardine. I know it was a great relief to us, at any rate, when the Jardine piston was developed and it functioned as it did.

Q. Ray Day is a double-wall construction? A. In part, yes.

Q. But you still say it embodied the improvements of the Jardine patent? A. It embodies one of the elements, at any rate, of the Jardine patent.

Q. Then, as a matter of fact, the distinguishing feature of the Jardine patent cannot be that it is a single walled structure? A. Not of the Jardine patent as a whole; but the Jardine disclosure as shown in Figs. 6 and 7 I think can be.

Q. And you would say then Figs. 6 and 7 illustrate the improvements embodied in the Ray Day piston, Exhibits 8 and 9? A. Possibly one combination, that is the skirt which is both flexible and is relieved upon the bosses or the portions which receive the heat directly from the piston head.

Q. In a case of this kind, the old maxim applied that things which are equal to the same thing cannot be equal to each other? A. You can philosophize on that, if you please.

Q. Now, in your discussion of the Jardine patent, I believe you made this statement that the Jardine patent was simply the Gulick patent with the walls cut away, which I understand to be those walls outside of the webs. A. No, I didn't at least mean to imply that it was simply that.

Q. Well, that is just about what Jardine amounts to, isn't that right? A. Jardine amounts to more than that.

Q. What more, would you say? A. In the double duty functions of the various parts of the piston which cooperate with one another to perform the many required functions of a piston and the utilization of a different mode of operation, or an added mode of operation from that of Gulick, as well as a rather marked simplification of structure and the lightening of the piston body.

Q. Well, Doctor, what is the difference, for instance, between the construction shown in sheet 1 of the Jardine patent, in which the webs are suspended directly from the head, and the Gulick patent construction as shown, for instance, in Figs. 1 and 2? A. (After examining same) With the exception of the web shape they would be to quite an extent similar.

Q. In other words, you cut out the outside skirt part outside of the web? A. Yes, that is true.

Q. If they are in the way, just cut them out; isn't that the proposition? A. If they are in the way? I don't know as that is the assumption, that they are in the way.

Q. They are in the way of casting with permanent molds? A. Well, perhaps the webs are in the way. That is what was previously thought, at any rate. Therefore take out the webs.

Q. There would only be two alternatives: take out the webs, or take out the skirt part? A. No, there were thousands of alternatives. After a thing like this is once developed and then you see the final results, you may bring them down to a few alternatives; but when people are trying to get those results and grapple in the dark, then there are thousands of alternatives.

Q. How do you know Jardine was trying to get these results? A. Because I had been connected with him in the same organization for several years prior to his achievement here.

Q. And he was struggling along on the solution of this problem? A. Yes, he was, as were many other people.

Q. But Jardine particularly was struggling? A. Yes, he was working hard on it.

Q. What caused the struggle to begin—was it Ricardo that Mr. Richey in his opening statement, or rather in his reply to my opening statement, referred to? A. No; the struggle began when the problem came with the excessive expansion of aluminum alloy pistons when operated in cast iron cylinders, and one only had to be connected with the piston business a few weeks to learn of that difficulty.

Q. The same difficulty today? A. It is still a difficulty, but it has been so successfully solved that millions of these pistons are in use and they are standard equipment on many cars on the street. They also are used on replacement in cars which are put out with cast iron pistons.

Q. Didn't you use the same language before Judge Faris and Judge Kerrigan in the mold cases?

Mr. Richey: I object to that as immaterial.

The Master: He may answer.

A. You were the one that contended, Mr. Bruninga, in those cases that it was the slotting of the skirt that solved the aluminum piston problem and made it a practical thing. I didn't so contend, although I never minimized the advantages of the slotted piston. The position there was very clear, that large numbers of pistons were made and sold and used without slits and slots and that those pistons were regarded as successful at the time. There was not the care taken in the removal of noises in those days that there has been during the last few years, but in so far as the position taken in the various cases, I think if you will read your opening statements and also your brief carefully, you will see that you were the one that claimed that it was the slotting of the skirt that made the aluminum piston successful.

Q. The expedient of slotting the skirt was the beginning of the automobile piston industry? A. It was the beginning.

Q. Isn't that what I said: that the beginning of the use of the expedient of slotting the skirt was the beginning of the automobile piston business as far as aluminum pistons are concerned? A. You mean you didn't use the

word "invention." I don't believe you used the word "invention," but you gave slotting of the skirt credit for making the aluminum piston industry.

Q. Did I say that all the credit was due to that or did I say that it was not until 1920 or 1921 that the piston really came to its own? A. No; you said that it was the slotting of the skirt that made the aluminum piston business successful.

Q. But you were very forceful in saying it was the permanent molding that made it successful; isn't that a fact? A. Yes, and it is. These ninety million pistons referred to by Mr. Whitney, and millions more, have been cast in permanent molds. That is essentially the aluminum piston industry and has been in the United States, that is, the permanent mold casting.

Q. And you were representing the Aluminum Company of America, one of the licensees in these suits, weren't you? A. Yes.

Q. When you stressed the permanent molding as being the solution of the problem? A. Yes.

Q. And you further stated that the same processes and molds were in use to-day and without any substantial changes? A. That is correct.

Q. And you didn't tell either Judge Faris or Judge Kerrigan that the splitting was the thing that made it successful? A. No, I did not, and it wasn't. Millions of pistons were made and sold before the splitting came in. I don't know how long the business would have lasted without the flexibility or how much it would be to-day. We certainly would have the aircraft business, probably, and a good deal of truck and bus business where noises aren't so important; but those are things I can't answer.

Q. Now, Mr. Richey mentioned a Mr. Ricardo in the reply to my opening statement, and he stated that the Aluminum Company of America had experimented with the Ricardo piston and found it a failure. A. That is correct.

Mr. Richey: Just a minute before you get that answer. My statement was in reply to my adversary's statement, and I object to the question as inquiring into the prior art on prima facie and as not having been named in direct examination.

The Master: Of course it has already been answered. The reply may stand and you may have your exception.

Q. Now, Mr. Jardine's efforts on the slipper piston, emulating in the Jardine patent in suit, were the continuation of the experiments with the Ricardo piston, isn't that right?

Mr. Richey: I make the same objection.

The Master: Same ruling.

A. No, not necessarily. The Ricardo piston had been tested and had been found wanting; that is true; but I know for a fact that Mr. Jardine was working on all kinds of pistons at the time.

Q. Well, how many Jardine pistons have been sold; I mean the slipper type? A. I suspect none.

Q. And how many of Ricardo's did the Aluminum Company of America sell? A. None, as far as I know.

Q. Then the Jardine piston has never been on the market? A. I think not. It was proved in, however, and was about ready to be placed on the market when the Maynard piston was brought forth, and the Maynard piston was the one that went into large commercial use.

Q. But the Ricardo piston wasn't on the market? A. No.

Q. Never was on the market in this country? A. Not that I know of.

Q. Hupp didn't use it? A. Not that I know of.

Q. What was the matter with the Ricardo piston? A. It slapped when it was fitted loose enough so that it would not stick or seize. It seized when it was fitted close enough that it would not slap. And it pumped oil.

Q. And that oil pumping was prevented by the Maynard piston? A. The oil pumping was greatly improved, yes, by the Maynard construction, that is true.

Q. And you had oil pumping with the Jardine piston? A. Yes. The Jardine piston was not very satisfactory from the standpoint of oil consumption.

Q. What was the difference between the Jardine piston and the Ricardo piston that you experimented with?

Mr. Richey: I object to that for the same reason.

The Master: Oh, he may answer and you may have your exception. Don't take very much time on this though.

A. The Ricardo piston was really built too rigid. We not only had over in this country a Ricardo representative, a Major Halford, but we had an automotive

engineer who was supposed to know a good deal about the Ricardo, about the developments and so forth, and the piston which they supplied the Aluminum Company was one which was built for rigidity, not for flexibility. So that the Ricardo piston as it was known to us was of the head construction more like the Jardine, Figs. 2 and 3, and the webs were thick and fairly massive, the skirt portion or the slipper was also fairly thick, and it was drilled full of holes in order to lighten it; but the Ricardo piston was built essentially for rigidity, to get a rigid structure. While the piston in Jardine flexed in a lateral direction, Ricardo was rigid vertically and laterally. Jardine is rigid vertically but flexible laterally.

Q. The slippers of the Ricardo piston weren't split? A. No, they were not.

Q. But as far as massiveness and material is concerned, the Ricardo piston was just about a picture of the first sheet of the Jardine patent structure? A. No; the Ricardo piston had much thicker walls all around, webs as well as skirt section.

Q. I don't mean as far as thickness of metal, but I mean a head with a couple of webs extending down, and wrist pin bosses carried by the webs, and slippers on the webs—that was the Ricardo piston? A. That is correct.

Q. And Jardine proceeded to split the slippers? A. Well, he did more than that.

Q. Well, he did that, didn't he? A. He did that, yes.

Q. And Gulick also did that, split the skirt? A. Yes.

Q. Between two webs? A. Yes; Gulick did that.

Q. And Jardine made the second split; is that right? A. Yes.

Q. But he made it on both sides? A. Yes.

Q. Now, take up the Gulick patent 1,815,733, that piston has never gone into commercial use? A. I believe not.

Q. You have never seen one in use, have you? A. In commercial use, no, not in the construction as shown in the drawings.

Q. It is just a paper patent, then; or don't you know? A. No, I don't think it is a paper patent. I think that is the patent which describes the first successful piston with a flexing skirt.

Q. You think it is the first one to describe that? A. I think it is the first one that describes an operative structure with a flexible skirt for aluminum construction.

Q. But still although it was filed in the Patent Office over fifteen years ago, it has never gone into commercial use as far as you know? A. Not in the form in which it is shown in the figures in the patent.

Q. It doesn't say a word about being used as an aluminum piston, does it? A. No.

Q. Doctor, we have been talking about side thrust, whether it is due to expansion or contraction. The side thrust is due to the pressure operating on the wrist pin which on account of the angularity of the connecting rod forces the piston against the cylinder wall; isn't that right? A. That is correct.

Q. And that pressure is transmitted through the wrist pin; is that right? A. Yes.

Q. Now, if you took the Gulick patent structure, and I hand you a cross section of a piston which is not intended to be a piston but simply a model,—that is a fair representation of Figs. 1 to 4,—I don't mean as to details, because I don't intend to hold you down to details, but just for illustrative purposes? A. (No response.)

Q. Now, if a piston of this kind is put into a cylinder and pressure is applied to the head, whether due to compression or due to the action of the explosive gases, the pressure is transmitted from the head directly to the wrist pin; isn't that right? A. Yes.

Q. And it is transmitted then directly from the wrist pin through the side webs to the skirt; is that right? A. Yes.

Q. So the thrust on these webs is transversely, isn't it? The thrust from the wrist pin to the cylinder wall is along these webs? A. Yes.

Q. There is also a pressure on the skirt having a movement through the cylinder and resisted by friction, isn't that right? A. Yes.

Q. And that friction is due to the pressure on the cylinder wall, of the piston on the cylinder wall? A. Yes, and to the state of the oil.

Q. Now, which pressure would you say is the highest,—the thrust pressure or the pressure due to friction? In other words, where is the greatest pressure on that web, transversely on the line 4-4 or vertically on the web 18, for instance? A. I am a little confused here as to what you mean by the vertical friction.

Q. There are two pressures on this web: one is a thrust pressure along a line 4-4. You realize that, don't you? A. Yes.

Q. Operating from the piston, from the wrist pin against the skirt and through this web? A. Yes.

Q. That is one pressure? A. Yes.

Q. There is another pressure on the web due to the pressure of the gases on the piston operating through this web 18 and resisted by the friction of the skirt? A. Well, of course it is resisted infinitely more by the resistance of the crank shaft to rotation.

Q. I am trying to get the pressure on the web. These webs do nothing but carry the skirt; isn't that right; these webs 17 and 18? A. Oh, they carry the skirt and they carry the wrist pin and they flex; they have quite a number of functions.

Q. Yes. But I mean as far as their doing any work is concerned, the side webs on the side of the wrist pin, the top part is the one that transmits pressure from the exploded gases to the wrist pin; isn't that right? A. Yes.

Q. And these webs really only carry the skirt, to function? A. That is one of the functions of the webs, yes.

Q. Now, the transverse pressure along the webs, along the line 4-4, that is the greatest pressure, isn't it, as compared with the pressure along the webs resisted by the friction of the piston in the cylinder? A. I should think so, yes.

Q. So therefore, if you want rigidity, you have to have rigidity crosswise of the piston and lengthwise of these webs 18; that determines your rigidity? A. Yes, to quite an extent that is true.

Q. And the thickness of these webs is determined by the thrust force due to the explosion? A. Oh, no, the thickness of those webs could be very much less and still stand the thrust force.

Q. I am not referring to any particular size web, but the thickness of those webs is determined by the thrust forces, isn't that right? A. In, I think, only minor parts.

Q. What determines the thickness of those webs? A. Well, the desirability for lateral flexibility in this case.

Q. Well, what determines the maximum thickness? I am not talking about minimum thickness; what determines the maximum thickness? A. Well, I think its flexibility determines the maximum thickness.

Q. In other words, you don't want it too flexible? A. I should think the question would be put just the other way.

Q. You want it just as flexible as you can? A. You want the right degree of flexibility.

Q. Is there such a thing as too much flexibility? A. Yes.

Q. What happens then? A. Well, the piston moves too easily in response to cylinder wall pressure.

Q. Do you think there is ever any trouble about that, if you make these webs thick enough so they can stand the thrust? A. Oh, I think the whole thing has to be designed with the object of gaining the mode of operation and results contemplated.

Q. The original specification of the Gulick application read as follows: referring to page 2, lines 10 *et seq.* of the patent—I am just going to read that paragraph, read you the original specification, and I would like to ask you some questions: "It will be seen that in addition to providing a piston with a split skirt the above described construction also provides an extremely rigid connection between the piston pin bosses and the skirt of the piston which construction may be used either with or without the split skirt and separated head." Now, when it describes "an extremely rigid connection" it must have had reference to webs 18 going radially from the piston pin bosses and the skirt? A. Yes.

Q. The specification now reads: "It will be seen that in addition to providing a piston with a split guide portion, the above described construction also provides a longitudinally rigid connection between the piston pin bosses and guide portion of the piston which construction may be used either with or without the split guide portion and separated head." It now refers to a longitudinally rigid connection. The longitudinally rigid connection is this connection (indicating)? A. No, it means it is rigid in a longitudinal direction, up and down.

Q. Rigid up and down? A. Yes.

Q. But not rigid cross-wise? A. Well, it might be rigid cross-wise in one direction, but not at a direction at right angles to that.

Q. But reading it without that careful word "longitudinally" when it states "also provides an extremely rigid connection between the piston pin bosses and the skirt of the piston," one would naturally assume that the "extremely rigid connection between the piston

pin bosses and the skirt of the piston," is this web or connection right here about at 16, Fig. 1; isn't that right? A. It would have to be in the connection between the boss portion and the skirt portion. But then so far as rigidity is concerned, that is of course incompatible with flexibility. He does have a rigid piston longitudinally, and a flexible piston laterally.

Q. Well, why must he have a rigid skirt longitudinally when the pressure is all lateral? A. The pressure isn't all lateral.

Q. Where is the pressure longitudinally on the skirt of a piston constructed like this with the skirt separated from the head and the head connected directly to the wrist pin bosses? A. The skirt of course must not move up and down as the piston moves up and down; that is, it must not move up and down relative to the other parts of the piston.

Q. But you have just admitted, Doctor Jeffries, a little while ago, that the side pressure was of much greater magnitude than the vertical friction pressure, you might say. Resistance cross-wise would be greater than resistance lengthwise, as far as this skirt is concerned, which has nothing connected to the piston and does not have any explosive strains on it at all. A. Well, you asked me only with reference to the explosion stroke, and with the exhaust stroke the thing is reversed.

Q. Well, suppose it is, what pressure is there on these webs? A. In the exhaust stroke, when the piston is moving upward, it is moving against practically no pressure; in the last half of the piston travel, it is really pulling up against the wrist pin, and it is the lower part of the webs that would take that stress.

Q. What stress—on a vacuum, or something like that? A. No; the inertia stresses of the piston.

Q. You think the inertia stresses are greater than the thrust stresses? A. At that particular time they certainly are.

Q. At that particular time they are greater than the thrust at that particular time? A. Yes; and possibly greater than the thrust at any time; I don't know. May I ask if these original drawings accompanied the original specification?

Q. Oh, yes. A. Well, then, it is clear enough what he had in mind. These drawings are susceptible of no other interpretation, as I see it. You have got longitudinal rigidity and lateral flexibility.

Q. You also have lateral rigidity, haven't you, along the webs? A. Along two lines, yes.

Q. And the way you would have read that before it was carefully amended, that instead of "extremely rigid," "very flexible"? A. No, I wouldn't be confused as to the description if I had the drawings before me.

Q. But you don't think for one moment that the expressions "extremely rigid" and "very flexible" are the same expression? A. They are not the same expression.

Q. But there must be, in a piston of this kind, rigidity along the webs during the thrust stroke, I mean during the time that the thrust is acting? A. Very little; that force is very small.

Q. Very small? A. Yes.

Q. Don't even wear the piston, does it? A. Yes, it wears the piston, especially if the oiling is not what it should be; but it doesn't take great pressure to produce wear on two metal surfaces.

Q. The thrust against the cylinder wall, you might say, is negligible? A. No, I don't say it is negligible.

(Short recess taken.)

Q. Are you familiar with the design of automobile pistons as far as strength of materials is concerned, Doctor? A. I am not familiar with the magnitude of the stresses encountered mathematically, no.

Q. You are not really able then to answer questions as to what relative forces are encountered and the building of a structure to meet those forces? A. No, not from the material strength and mathematics of it, I am not.

Q. You may be able to answer this question: if not, say so. What I want to know is what determines the thickness of these ribs, the transverse stress due to the thrust, the stress along these ribs now, or the vertical stress along these ribs due to the inertia on account of change in direction, keeping in mind now that this skirt is entirely separated from the head in this Gulick piston. A. Well, I don't see how you can separate one from the other. That is, your finished piston design is supposed to take care of all the stresses and do all the functions that are required of the piston.

Q. But the stresses set up in these webs due to reciprocation are more shearing stresses, aren't they? A. In the webs, yes.

Q. In those webs? A. Yes, I think that is true.

Q. And the stresses due to the angularity of the connecting rod and the thrust are bending stresses, are they not? A. Yes, they are bending stresses and column stresses.

Q. Would you not say then, Doctor, that the thickness of the web is really determined by the stresses due to the thrust? A. Well, that may be one of the factors.

Q. Well, wouldn't you say that is the determining factor? In the design of machinery you have certain determining stresses, and you can just eliminate all the others in some problems? A. No, I wouldn't say that. This piston is made, among other things, to flex, so the flexibility factors have to be given consideration.

Q. Well, let's assume that it is made to flex. I haven't undertaken to dispute you on that point at all. But let's determine what determines the thickness of these webs, the thrust, stresses due to thrust, or the stresses due to restriction, that is shear stress? A. Oh, I think perhaps the thrust forces would determine more the thickness, because if they were very thin they certainly would have a tendency to bend.

Q. Then the thickness of the web would be determined by the thrust? A. No, I told you the thickness is a complicated thing, and must depend on all the functions required of the piston.

Q. Flexibility and everything else? A. Yes.

Q. Now, as far as flexibility is concerned, the rigidity, extreme rigidity, has nothing to do with that, has it? In other words, the more rigid you make it in order to take up the thrust, the less flexible it will be? A. Generally speaking, the more rigid you make it laterally the less the lateral flexibility.

Q. And if I make the statement that there should be an "extremely rigid connection between the wrist pin bosses and the skirt," I mean rigid enough to take up the stresses or to take care of the stresses due to the thrust? A. To a large extent, yes.

Q. Now, that may be sufficient to permit flexibility; we haven't come to that at all; but when a man talks about it being "extremely rigid," "an extremely rigid connection between the wrist pin bosses and the skirt," he means rigidity in this transverse connection along the rib, doesn't he? A. Yes, I think that is true.

Q. You don't know what the thrust is in an ordinary automobile engine? A. No.

Q. Now, the split in this Gulick piston is on a bias, and that is also true of all these pistons before you. You

know why that is, don't you? A. Yes; it is stated, I think, in the, if not in the Gulick patent, in some of the others, that that feature of the split is for the purpose of helping to wipe oil on the cylinder wall, in order not to cut a groove up and down in the cylinder barrel.

Q. If it was a straight up and down slit, it would finally wear a ridge or groove, or whatever it is, right in the cylinder? A. It might do that.

Q. That is what they believed, anyway? A. That is what has been suggested, at any rate.

Q. That is quite an old expedient, isn't it? A. In this connection?

Q. Well, all piston rings are split on the bias, are they not? A. Well, that is quite a different operation.

Q. But they are split on a bias, and have been ever since 1915 when you first took up with pistons? A. I think so; that is true.

Q. Now, the opening in the skirt of the Gulick patent, 24, is really for the purpose of permitting insertion of the wrist pin; isn't that right? A. Yes.

Q. And that is described in the specification as follows, page 1, lines 98, *et seq.*: "The skirt 11 is formed with openings 24 in its side registering with the openings through the bosses 16 so that the piston pin may be inserted." The specification then continues, and I will later on show that was added by amendment: "As these openings are well above the bottom of the guide portion of the piston, the lower end of the piston skirt is left unbroken except for the split 21, and the arcuate parts of the skirt beneath said openings may be looked upon as joining the lower ends of the diametrically opposite cylinder-engaging parts of the guide that sustain the angular thrust of the connecting rod." That descriptive matter would also apply to this Spillman & Mooers patent structure, wouldn't it, leaving out the split?

Mr. Richey: I object; inquiring about the prior art.

The Master: 'Same' ruling. This Spillman & Mooers was referred to by the plaintiffs, was referred to in one of these patents in suit, and I think it is proper cross examination.

A. That is correct, I think.

Q. So that there is nothing really new or novel added by that statement? A. I don't know.

Q. Well, if it was shown in the Spillman & Mooers patent it couldn't be new and novel, that statement as to

the function, leaving an unbroken part below the skirt and so forth? A. (No response.)

Q. The patent specification also states that the web structure may be used without the skirt; is that your understanding that it may be so used, and still attain some of the advantages of the Gulick patent structure? A. You said without the skirt?

Q. Without the split. A. I think it is so suggested in the specification, yes.

Q. Now, when we come to, let's take up the matter of yielding. That skirt of the Gulick patent is split. It doesn't tell you the magnitude of the split, but it shows a separation at 21. Now, what happens when the piston heats up, after it is fitted to a cylinder and fit fairly close when cold? A. The skirt section would normally expand and the head section of course would expand also to a certain extent.

Q. And the skirt section would finally expand and the slot would close or tend to close? A. That is correct.

Q. Do you know, in practice, just how much closing actually takes place, for instance, in the piston such as shown here, the Ford piston in which the slot is about 1/16" wide? A. I think usually a closing of a very few thousandths of an inch is all that is required.

Q. Would you say about half of that sixteenth is all that is required? A. A half of the sixteenth of an inch?

Q. Yes; a thirty-second of an inch? A. Oh, that would be much more than is required in practice.

Q. In fact, a thirty-second of an inch is .003; isn't that right, approximately three thousandths? A. Approximately thirty thousandths.

Q. Approximately thirty thousandths. Now, how much flexing of the webs would take place with a closure of, for instance, thirty thousandths? A. Very considerable. I don't know actually how much.

Q. Well, it wouldn't be over half of that amount? A. It would be perhaps less than that, because the skirt would also flex some.

Q. But your position is that from those drawings the inherent structure is such that these webs 17 and 18 would flex? A. Yes.

Q. Could you make them any way so they would not flex? A. Yes.

Q. I am not adverting to that structure, but make these an inch thick, the webs an inch thick. A. Oh, if

they are made an inch thick, you haven't a practical piston at all.

Q. Well, do you think that the webs would flex to permit closing of the slot? A. Not perceptibly, no.

Q. There is a certain limit that you could go to. Do you know what that limit is in the Gulick piston? A. No.

Q. You haven't made any experiments of that? A. No, not to determine web thickness.

Q. You would consider the patent drawing, if that shows webs of about the right size that will flex? A. Yes.

Q. It is your opinion they would flex? A. Yes.

Q. How did you find that out,—by experiment or theoretical determination? A. By experiment. I have here a Gulick piston which appears to be also made very closely to the drawings of the Gulick patent, corresponding to the Figs. 1 and 2 construction.

Q. Except that the head is not concave? A. No, the head is not concave.

Q. You don't consider that that makes any difference? A. Not materially.

Q. What size piston is this for; what kind of car—for an Oakland, isn't it? A. Yes, I think it is.

Q. It is about the size of a motorcycle cylinder? A. It is a commercial size piston.

Q. Who made that piston? A. I don't know.

Q. Where did you get it? A. From Mr. McCoy.

Q. It is a very small piston, isn't it? A. Yes, it is a small piston.

Q. And you tested that out? A. I tested this with respect to its flexibility.

Q. And it is flexible? A. Yes.

Q. The clearance allowed on pistons is a certain amount per inch in diameter; is that right? A. Yes.

Q. And the smaller the diameter the smaller the clearance? A. That is correct.

Q. The smaller the diameter the smaller the expansion? A. Yes.

Q. And the smaller the flexure required? A. Yes.

Q. So the flexure on that is about as small as you could possibly make it; is that right, in commercial use today? A. No.

Q. Do you know any smaller piston than that? A. Well, the flexing is not merely a matter of size; it is also a matter of construction. I know of smaller pistons than this.

Q. What piston is smaller than that? A. Motorcycle pistons.

Q. Have you any particular one in mind? A. No, I haven't any particular one in mind at the moment.

Q. Are these motorcycle pistons split at all in practice? A. I think they are.

Q. Do you know whether they are? A. No, I am not sure.

Q. Do you know of any motorcycle pistons that are not split at all? A. No.

Mr. Richey: I will offer that Gulick piston in evidence as Plaintiffs' Exhibit 20.

Q. Are you familiar with the Excelsior motorcycle? A. No.

Q. You know of it, don't you? A. No, I don't.

Q. Would you say, then, Doctor, that in order to secure flexibility, flexible webs, flexure of webs in a structure like the Gulick patent, that the webs 17 and 18 would have to be a certain minimum thickness for any piston diameter? A. With a definite skirt thickness, yes, and also with a definite vertical height of web that would also be true. That is, considering Fig. 1 of the Gulick patent, if the height of the web from a position near the line 4-4 vertically downward or angularly downward towards the figure 17 were made less, then the flexibility of the web would be greater. So that the flexibility is not merely the function of the web thickness, but it is a function of the height of the web. The stiffness does, however, vary as the cube of the thickness, and merely as the first power of the height.

Q. But you have to be pretty definite in your design in order to secure sufficient flexibility to permit closing the slot or partial closing of the slot to compensate for expansion in a structure like in the Gulick patent? A. Well, it certainly could be made so that it would not flex enough, and it could be made so that it would flex too much. It happens, or it is a fact that the Gulick construction appears to flex a proper amount.

Q. You wouldn't say then that the inherent flexibility of any structure having cross webs is then sufficient to permit a skirt to contract circumferentially in order to compensate for expansion? A. No, I would not. This contraction is not a circumferential contraction in the sense that the entire circumference is contracted. It is a reduction of diameter by the closing of this slot, by the general cantilever principle.

Q. Will you explain how that cantilever principle works? A. Well, in the Gulick construction, the whole of the skirt is permitted to move from top to bottom by virtue of the complete horizontal slot as shown in Figs. 1 and 2; it is permitted to move throughout its length by virtue of the vertical slot 21. When the pressure is applied, the part of the piston just opposite from the side which is slotted, in that case it would be the part in front of the diagram in Fig. 2, that portion would serve as the fixed end of the cantilever, and the portions at the slot would represent the movable ends of the cantilever. So that the beam length would be equivalent to the diameter of the piston in that particular case. So that represents what might be called the cantilever principle of flexing.

Q. That is, flexing due to pressure on the cylinder walls; is that right, due to thrust? A. Yes; due to thrust or due to expansion.

Q. Now, as far as expansion is concerned, when that piston skirt of the Gulick patent heats up, there is a growth circumferentially, too, isn't there? A. Yes.

Q. And where is that growth taken care of, for instance, in this region opposite the wrist pin bosses and between the ends of the webs? A. Well, it is taken care of by the clearance and also if necessary by the deflection of the whole skirt.

Q. When this part, indicating around 24, begins to grow on account of the increase in temperature, is it your position that the web 17 flexes in order to permit that growth, or that the webs will heat up at the same rate or greater rate? A. Well, I can't say they heat at a greater rate or they heat at a lesser rate, but at any rate the two parts heat up together, and to that extent they balance one another.

Q. In a structure of that kind it is no small job to design, to get the right thickness and to get the right flexures; is that right? A. You mean now?

Q. Well, in 1917? A. Why, I should think it would have been quite a task.

Q. Even a means of designing, the proportioning of the materials after the structure was delineated in the drawing generally? A. You might have to do some experimenting to get just the right combination of flexing and rigidity desired for that particular structure.

Q. The Jardine patent goes quite a length, doesn't it, on page 2, in stating that the webs should be properly proportioned to permit that flexing? A. Yes.

Q. And the Gulick patent doesn't say one word about it, does it? A. He states that the structure should flex in response to cylinder wall pressure.

Q. He does in the patent as it stands now to some extent; but in the absence of any statement of that kind that the webs do flex, what have you to say then? Do you think the disclosure is sufficient just from the drawing to delineate that which Mr. Jardine found necessary to state quite in detail? A. It is not a treatise telling one how to design any particular piston, as I see it; but the principle of the compensation for excessive expansion by flexing by means of horizontal and vertical slots is clearly covered in the Gulick disclosure.

Q. Well, I am asking now about the drawings. You can read drawings, and to your mind they give you a complete picture, don't they? A. Fairly complete, yes.

Q. And those drawings, with the simple statement that the piston is made to take care of expansion, that would be enough to give you the idea that the webs should be properly proportioned to flex? A. I think so.

Q. Due to the inherent structure? A. Yes.

Q. And if you found out from the drawings themselves that the webs weren't of the right thickness, you would just sit down and make them the right thickness, wouldn't you, in designing them? A. Why, I think if I tried this out and found it didn't work, I might be suspicious of the description and mode of operation or something of that sort; I don't know what might happen.

Q. In other words, you would give up right away if the Patent Office drawings wouldn't give you an operative structure? A. Not necessarily.

Q. You wouldn't try any different thickness webs at all to see if that would give you too much or too little flexibility? A. Oh, I don't know what I would do under the circumstances.

Q. You can't even tell me as an engineer skilled in this art? A. No. When you have a thousand possibilities or even twenty possibilities, it is difficult to say just how far a person would follow one or the other up.

Q. Now, comparing the Gulick patent structure with that of the Sterling type piston and taking up first the connection from the head to the skirt, in the Gulick patent structure the head and skirt are separated entirely, aren't they? A. Yes.

Q. That is not by any means true of the Sterling type? A. No, that is true.

Q. Of the Sterling type, Exhibit 1, for instance? A. That may not be clear. The connection between the head and skirt is structurally different in Plaintiffs' Exhibit 17 from that shown in the Gulick drawings.

Q. The mode of operation is also somewhat different, isn't it? A. Plaintiffs' Exhibit 17 embodies as one of the elements of the combination the flexing mode of operation disclosed in Gulick.

Q. Only at the bottom; isn't that right?

Mr. Richey: I think he has got the plaintiffs' piston, and you asked about the defendants'. Is that what you want to do?

Mr. Bruninga: They look—

Mr. Richey: All right. Same pistons.

Q. What have you? No. 1 or 17? A. I have Plaintiffs' Exhibit 17.

Q. Well, take Exhibit 1, because that is what we particularly referred to. A. In Plaintiffs' Exhibit 1 when the slot is completed, it involves as one of the elements of the combination the flexing as the result of a horizontal and a longitudinal slot at both top and bottom of the skirt and at all points between.

Q. Well, Exhibit 1 really flexes only at the bottom, doesn't it? A. No. I showed you this morning that it flexes at the top as well, and furthermore I stated that unless the slot is completed at the top of the skirt, that is, unless the vertical slot joins the horizontal slot, the piston is not successful for use.

Q. Well, you showed me by applying a pressure many times that encountered in an automobile engine. A. Yes, but I showed you many times the deflection that is required to compensate for the excessive expansion also.

Q. The Gulick patent structure doesn't have the keystone relief, does it? A. No.

Q. There must be some reason for that. A. Yes.

Q. Is the Gulick patent structure inoperative because it doesn't have the keystone relief? A. No; the Gulick patent structure is operative because it has great flexibility at the top of the skirt as well as at the bottom of the skirt.

Q. And defendants' infringing piston structure only has great flexibility at the bottom? A. The defendants' structure, as shown in Plaintiffs' Exhibit 1, has greater flexibility at the bottom of the skirt than at the top of the skirt.

Q. In defendants' piston structure the wrist pin bosses are inside of the skirt outline; isn't that right? A. Yes.

Q. And that is not true of the Gulick patent, the skirt extends around? A. Yes, that is correct.

Q. In the Gulick patent structure the wrist pin bosses are suspended from the head itself, are they not? A. Yes.

Q. And in defendants' they are really on the skirt, are they not? A. They are in a web which attaches to the skirt and to the bottom of the ring flange.

Q. Well, you call that a single walled structure; that means they are on the wall of the wall structure? A. They are on the wall structure, yes, that is true.

Q. Now, in the Gulick patent structure the skirt is really independent of the head, and entirely disconnected? A. At the top, yes.

Q. And in defendants' it is really a part of the head, the skirt, is it not? A. It is hardly a part of the head; it is integral with the ring flange on two sides above the bosses.

Q. Well, defendants' Sterling piston is really a trunk piston with a T-slot, is it not? A. No, I wouldn't call it that.

Q. Well, it has its sides depressed so that part of the wrist pin bosses are on the outside of the skirt? A. The defendants' piston, as mentioned a number of times before, embodies a number of elements of construction designed to cooperate with one another and to perform all the essential functions of the piston and in addition take care of the excess of expansion as the result of the use of aluminum in a cast iron cylinder.

Q. Will you please answer that yes or no? A. I don't know what you mean.

Q. Don't you understand that question? A. Yes; but I don't know of any trunk piston that answers that description.

Q. Isn't that exactly what defendants' piston is,—a trunk piston with a T-slot and the sides depressed so that the wrist pin bosses will be partly outside of the depressed part of the skirt? A. Well, that might describe some of the features of the defendants' piston, but taking for example the trunk cast iron piston, Defendants' Exhibit 3-H, I see no part of the boss in such a piston outside of the skirt.

Q. I didn't ask you that. I asked you whether that is not what you obtain as a result, a trunk piston with

its sides depressed so that the wrist pin bosses are outside of the depressed part, extend outside of the depressed part, and with the T-slot? A. I think, if you wish to have this described as a modified trunk piston, we should perhaps get all of the modifications.

Q. Oh, no, you don't have to answer then. Now, comparing the Gulick piston structure with the Spillman & Mooers patent, using the two halves, in both cases you have the wrist pin bosses or a structure carrying the wrist pin bosses, leading directly from the head, haven't you? A. Yes.

Q. In both cases, the structure leading from the head and which is in two halves, carries the wrist pin bosses? A. Yes.

Q. In both cases you have holes opposite these wrist pin bosses in the skirt, haven't you? A. Yes.

Q. In both cases the wrist pin carrying structure leading from the head is then connected to the skirt? A. Yes, in different ways.

Q. I expected you to say that. Now, I want to call your attention to the fact that the difference is that the connection is simply along the skirt in the Gulick, while it is over at the extreme bottom or a little bit above the bottom in the Spillman & Mooers; that is the difference, isn't it? A. Well, the difference is that the Gulick is connected longitudinally, and the Spillman & Mooers is connected circumferentially.

Q. Spillman & Mooers is connected circumferentially because the connection extends around the bottom instead of along the piston itself? A. Yes, the connection on Spillman & Mooers is entirely in a horizontal plane, whereas the connection in Gulick is on two vertical planes.

Q. You consider that a great distinction? A. Well, it is a difference in structure and also has in it the elements for different modes of operation.

Q. And that is a characteristic feature of the Gulick structure, that the connection leading from the head to the skirt extends along the piston? A. That is the structure that is shown in the Gulick drawing and in the section which you have before you.

Q. But that is a distinction between the two structures; isn't that right? A. I should say so in the typical structures of both patents.

Q. And you say that is an important distinction between them? A. It is in so far as the flexibility is con-

cerned in one case as in the case of Gulick, and perhaps with reference to the mode of operation of both structures.

Q. You wouldn't say it was an essential distinction, would you? A. Well, it seems fairly distinctive to me.

Q. But it is not in the Ray Day piston, which you contend is within the Gulick patent? A. No, it is not.

Q. In fact, the distinction between Ray Day and Gulick is about as much of a distinction as between anything you can think of? A. No; the Ray Day piston has the Gulick mode of operation and result. It also has the same web construction at the top, but it does have differences in construction from the Gulick construction shown in the drawings. It has the boss, for example, mounted partly in the skirt and partly in the web; but the mounting of the boss to the skirt forms the connection between the upper part of the piston and the lower part of the piston in Ray Day. And the webs in Ray Day flex just the same as the webs in Gulick flex; and the Ray Day piston is slotted horizontally the same as Gulick, and it is slotted vertically the same as Gulick; it operates like Gulick.

Q. And it is slotted horizontally the same as Spillman & Mooers? A. It is slotted horizontally the same as Spillman & Mooers.

Q. But Spillman & Mooers is not slotted vertically? A. Spillman & Mooers is not slotted vertically, no.

Q. And that is one of the distinctions which you want to point out now between Spillman & Mooers and the Gulick; that it is not slotted vertically? A. That is one distinction.

Q. You don't know, of course, that the Patent Office told Gulick that was not a patentable distinction?

Mr. Richey: I object to that as being immaterial.

A. No, I didn't know that.

Q. Then it is not so important as a distinction and characteristic feature, if you consider Ray Day comes within this Gulick patent, that in Gulick the connection is along the skirt, and in Spillman & Mooers it is at the bottom; that is not such an important distinction, is it?

Mr. Richey: Haven't we been over it two or three times? I object to it as immaterial.

The Master: He may answer. Just shorten it up, though.

A. It perhaps does not embody the latitude or breadth to which Gulick may be entitled or which the Patent Office considered Gulick was entitled to, in so far as specific construction is concerned.

Q. But you will have to admit that these two models look deceptively alike, don't they; the one in the Gulick patent and the other in the Spillman & Mooers patent? A. No, I shouldn't say that they did when one makes the web connection through practically the entire length of the piston and the other merely on one cross section.

Q. Doctor, would you say that on account of this wee little rib along here that the real connection between the web and the skirt goes beyond the point about even with the center line of the skirt? A. Well, it does in that construction.

Q. It does in that construction? A. Yes, and it does in the drawing.

Q. You think this small amount is sufficient for you to say that the web extends up to the top of the skirt? A. Yes, I think so.

Q. And that is not so in the Spillman & Mooers because there doesn't happen to be a little teeny web along there? A. No; the distinction is quite different.

Q. But at least there is an inside wall there that extends from the connection to the top of the skirt somewhere? A. There is the skirt itself.

Q. It would be just a matter of making the wall thicker, isn't that right? A. Just a matter of changing it.

Q. Just a matter of making the wall thicker at that point? A. Just a matter of changing it from a horizontal connection to a vertical connection.

Q. You would say then that web extends to the top of the skirt? A. Yes, it does.

Q. And there is flexing in this air part here, that is out in the air? A. Flexing of the air—it doesn't sound like a reasonable question to me; I don't know how you mean it.

Q. You say the web itself extends to the top of the skirt. A. The web connection to the skirt, yes.

Q. Then there is flexing of the web? A. There is flexing of the entire web, yes.

Q. The entire length of the skirt? A. The entire length of the skirt.

Q. There is flexing of this web the entire length of the skirt? A. Flexing of the web the entire length of the skirt.

Q. And part of it is in the air, like the air groove of the Maynard patent? A. Oh, I think not. I think it is clear enough what the mode of operation is.

Q. I just wanted your view of it, what it was. Now, the Spillman & Mooers patent doesn't show a split, does it? A. No.

Q. And you demonstrated to your own satisfaction, I believe this forenoon, that the structure was weak on account of the fact that you could press this model, press the edge of the Spillman & Mooers model skirt in at the top? A. That is only one reason why I said that.

Q. That is due to the fact that this is a half section; isn't that right? A. That is only partly due to that.

Q. Well, I want to show you a full piston, Doctor, and see whether you still adhere to that opinion, marked for identification as Defendants' Exhibit 3-P.

Mr. Richey: I object to it. In the first place it is not the Spillman & Mooers patent or piston.

Mr. Bruninga: A slit has been made in that piston between the wrist pin bosses and it is different to that extent. I think I am fully justified in that because, as I will show later on, the Patent Office told Gulick's attorney distinctly that no patents would be granted on the splitting of Spillman & Mooers' skirt.

Mr. Richey: By his own admission he admits it is not the Spillman & Mooers patent structure; therefore it is not part of the prior art; no charge of infringement; nothing to do with the case.

The Master: He may answer and you may have your exception.

A. Yes, I can feel the flexing even in the solid side with the pressure of my own two hands.

Q. What would you do to stop that flexing? A. I don't know.

Q. You can't conceive of a thing? A. (No response.)

Q. I can also flex this Gulick patent structure, can't I, the half section? A. I suppose so; it is made to flex. I can flex it inwardly.

Q. Well, what is the objection then to the top of the skirt flexing in the Spillman & Mooers structure Exhibit 3-P? A. Well, the objection which I suggested is briefly this: this Spillman & Mooers construction has the head separated from the skirt, and the connection is

nearly down to the bottom of the skirt on a horizontal plane. Now, as the piston is forced against the cylinder wall, that force comes from the piston head, transmitted to the wrist pin, which in turn transmits the force to the cylinder wall. There is a tendency therefore for the head of the piston to move in a direction perpendicular to the axis of the wrist pin, and for the head section then to be thrown from one side towards the other side of the cylinder barrel. That tendency is evident from the flexing of the top of the skirt with reference to the bottom of the ring flange. What I said was that the head would have to be machined more closely to the size of the cylinder barrel to avoid too much movement of the head in that direction.

Mr. Richey: I object to that part of the question, and the answer, both, which refer to this thing here, Exhibit 3-P, as a Spillman & Mooers construction.

The Master: The same ruling.

Q. You don't know whether such thing can happen with the Gulick type piston; is that right? A. Well, the Gulick piston has this vertical connection of the webs which carry the bosses, so that the portion of the skirt adjacent to the ring flange is not left unsupported on the thrust faces to be moved with a long lever arm such as in the Spillman & Mooers construction.

Q. And that result is obtained in the Gulick patent by extending the web along, as you said, from near the bottom to the top of the skirt; is that right? A. No; it is obtained by having the boss connected to the skirt higher up on the piston, at any rate.

Q. And that structure is not in the Ray Day piston? A. That structure is partly in the Ray Day piston, and because the web is attached to the skirt at the bosses, not ~~a~~r below the bosses.

Q. In other words, the distinguishing feature in that respect between Gulick and Spillman & Mooers, is not in the Ray Day piston? A. Yes, it is present in the Ray Day piston to an extent, but not to as great an extent as in the construction shown in the Gulick patent.

Q. You mean the result is present in the structure? A. I mean the result is present, and an equivalent or a partially equivalent structure, at any rate.

Q. And in the Sterling piston structure, that is in the Sterling type piston, the Plaintiffs' Exhibit 1, there

is again a different structure, isn't there? A. A. Yes, there is a different structure.

Q. But now, considering this split Spillman & Mooers piston, the flexibility is very nice at the top; it is very springy at the top, isn't it? A. It is quite springy, yes.

Q. The maximum flexibility is really at the top of that skirt, isn't it? A. Yes.

Q. And the minimum flexibility is at the bottom? A. The minimum flexibility would be right at the junction of the web with the skirt.

Q. You wouldn't say this is incapable of flexing? A. No; I wouldn't say it is incapable of flexing.

Q. You would think that even at the bottom, the structure at the bottom is not such as to prevent compensation for expansion? A. I would say it is practically so.

Q. To prevent expansion? A. To prevent expansion by normal cylinder wall—to prevent contraction by normal cylinder wall pressure.

Q. You consider yourself as having a stronger grip than I? A. I don't know.

Q. I am able to use this tool, Exhibit 3-I, to flex the bottom of that skirt, am I not? A. Yes.

Q. And try it yourself and see if you can flex it much easier than you could Exhibit 17. A. Well, it is easily flexed with this device at any rate. And it would be a mere matter of quantitative measurement.

Q. But easier than the top of Exhibit 17 that you had to mar? A. I should say not, but I would want to reserve judgment on that, if there is any point in determining it.

Q. You wouldn't say then, Doctor, that the Spillman & Mooers patent structure that is split between the wrist pin bosses, is incapable of sufficient flexure or yield so as to permit partial closing of the slot sufficient to compensate for expansion? A. Yes, I think it would be quite impracticable. You see there is no other means provided in this case to compensate for such expansion, and if one depended entirely on that springiness, it is entirely too difficult to flex.

Q. But it can be flexed, can it not? A. Oh, yes, one can flex a steel rail.

Q. And if you put it in a cylinder and subject it to temperature conditions, it will flex, will it not, in your opinion? A. It will flex a very small amount in response

to wall pressures, and then I feel certain that it would cause seizure unless you finished the bottom of the skirt so that it would function without any slot in it at all.

Q. Have you tried it out? A. No, I haven't tried this out, but I have tried many pistons as to degree of flexibility.

Q. But you have never built the Spillman & Mooers structure as shown in the Spillman & Mooers patent and tried to split the skirt and tried it out? A. No, I haven't.

Q. And you have never seen it done? A. No, I haven't.

Q. You don't know of any one who has done it? A. No.

Q. Don't you consider it rather strange, with the issue as we have it today, that that wasn't done? A. No.

Q. You weren't asked to do it? A. No. This piston, even if it were made would be entirely impracticable, double-walled heavy structure; it means nothing in the art as far as I can see.

Mr. Richey: You mean even if it were split?

The Witness: Even if it were split.

Q. And that is all founded upon your opinion and not upon any experiments whatsoever? A. That is founded on about seventeen years of experience in the aluminum piston business.

(Thereupon adjournment taken to the following day.)

(9:30 A. M., Saturday, January 21, 1933, the hearing was resumed.)

Q. In this split piston, that is in which the skirt is split longitudinally, it is particularly desirable to have good flexure at the top, isn't it? A. Yes, unless the expansion is compensated for by other means.

Q. It is not so necessary to have a high degree of flexure at the bottom? A. No, it is not. Of course if the bottom depends entirely on flexure to compensate, then it is very essential that that flexibility be proper.

Q. Well, if an ordinary piston such as shown on Exhibit 14 is simply split from the bottom to the top without any cross-cuts at all, there will be flexure at the bottom, then? A. Yes.

Q. In fact the split need not go to the bottom at all, as illustrated for instance by Defendants' Exhibit 3-O?

Mr. Richey: We object to that as immaterial, a question regarding that piston.

The Master: He may answer; you may have an exception.

A. That is true. In Defendants' Exhibit 3-O there is a provision for the expansion at the bottom by very careful fitting and also usually by some kind of special grinding, and in this particular piston the diameter is small and the need for compensation is therefore small.

Q. In other words, in a small piston, even as large as Exhibit 3-O, the matter of expansion don't enter into it as much? A. Not as much as in the larger, but still it is sufficient so that no aluminum piston of the size of Defendants' Exhibit 3-O, so far as I know, is usable in present day pleasure cars without flexibility.

Q. You referred to special grinding, what did you have in mind? A. I mean in the first place a very careful fit between the bottom of the skirt and the cylinder barrel, and in the second place preferably an oval grinding of the bottom.

Q. You mean an oval grinding in which the diameter across the wrist pin bosses is less than at right angles thereto? A. Yes.

Q. In the Ford eight piston, Defendants' Exhibit 3-J, there is a special cam grinding resorted to, as shown on that exhibit, isn't there?

Mr. Richey: I would like to make the same objection. Piston, Defendants' Exhibit 3-J, has nothing to do with any issue in this case.

Mr. Bruninga: It has not?

Mr. Richey: Not at the present time. There is no proof that any of the defendants made, sold or used that piston or any evidence it is in the prior art.

The Court: Same ruling.

A. Yes, a cam grinding is resorted to in this piston.

Q. In order to get the effect of the keystone structure that I have referred to a number of times, is that right?

Mr. Richey: Same objection.

The Master: Same ruling.

A. It does get that effect in a sense, but it does a little more, it aims to make the relief quite exactly the amount required at the different places so that the piston will have a larger bearing area against the cylinder wall.

Q. Now, in the Gulick patent the drawing shows three distinct annular ribs on the inside going circumferentially around the skirt, isn't that right? A. Yes.

Q. And also a little inturned part at the bottom? A. Yes.

Q. And also inturned part at the top? A. No.

Q. Now, all of those would tend to stiffen the skirt circumferentially? A. Yes, that is true.

Q. Would you say that the yield of the web in the Gulick structure is the same as in the Jardine structure, I am talking about webs now as they are illustrated in Figs. 1 to 4 of the Gulick patent and 6 to 9 of the Jardine patent? A. I should say that the yield of the web perhaps is somewhat greater in the Gulick construction as shown than in the Jardine construction.

Q. Would you say that both of the vertical flexure and lateral flexure of the web? A. Oh, neither of them has any vertical flexure to speak of.

Q. In other words, there is no flexure in the Jardine which permits the bottom of the skirt to tip in? A. No, I think not, at least not to any great extent.

Q. Will you refer to the Jardine patent, Fig. 1, in connection with the descriptive matter beginning line 34 of page 2, and going down to line 53, the end of the paragraph, and tell me whether there is any vertical flexing contemplated there, particularly with reference to the line 13-13, Fig. 1?

Mr. Richey: I object to the question as immaterial. The one part of the disclosure has got to be taken in connection with the other part. What if one part don't say anything about vertical flexing, it is immaterial whether it does or not, unless you consider it with the entire disclosure.

The Master: Same ruling.

A. I can't see anything in there that refers to vertical bend, vertical flexing. The statement is that the web 6 will bend along a line extending vertically down from the ends of slots 11a, that is, the bending will be a horizontal bending, but it will be a horizontal bending along a vertical line as the axis of bend.

Q. That is the way you construe that language? A. Yes.

Q. Now, that line on Fig. 1 will correspond about to the line running from the inner end of the slot 29a on Fig. 6 of the Jardine patent, isn't that right? A. That is correct.

Q. And in Fig. 6 the slot is not shown as far in as Fig. 1? A. No.

Q. That shows a variation in the flexibility of that skirt; in other words the flexibility of the web 6 in Fig. 1 will be greater than in the webs 25 in Fig. 6? A. Well, I don't know what the flexibility requirements might be, what the size of the piston might be.

Q. Well, as far as those particular constructions are concerned, if the slot extends in further there will be greater flexibility of the web; you gather that from the sentence beginning line 40, page 2, don't you? A. Well, the means are described for helping the web to flex. In the first place the horizontal slots are put in at the top of the skirt, and then mention is made of proportioning the web thickness and also the skirt thickness to facilitate the flexing. I don't conceive that there is meant to be a particular difference between the one and the other in the function and mode of operation.

Q. Well, you said in answer to a previous question that there is no vertical flexing of the skirt slipper contemplated because of the slot 29a in Fig. 6 or the slot 11a in Fig. 1, but there is a lateral flexing contemplated of the web? A. Yes.

Q. Well, now, as a matter of fact with the same thickness of web, the closer that slot is placed to the center of the piston, I mean the slot 29a, Fig. 6, or the slot 11a, Fig. 1, the greater will be the flexibility of that web; is that right? A. That is true with a given height of web.

Q. I am assuming all the other dimensions to be the same? A. That is correct.

Q. So as a matter of fact it is true that taking the two structures, Figs. 1 and 6, that with the thickness of the web and the depth of the web the same, and with the diameter of the piston the same, the webs of Fig. 1 will have greater flexibility than those of Fig. 6? A. They might have, yes.

Q. Well, isn't it a fact they do have, Doctor? A. Well, I don't know whether there is any point to that. All these pistons are supposed to describe pistons that flex and also pistons that have certain other characteristics.

Q. Well, regardless of whether there is any point to that, Doctor, as a matter of fact isn't it so that my question should be answered in the affirmative? A. I don't know that it is. I would like to make a little study of it, if you think there is any point to it.

Q. What do you think, then, is meant by the statement here: "If said slots are terminated closer to the guide segments 10, 10a the region of bending will be moved outward correspondingly"? A. He means just what he says. He gives you a means for controlling the degree of flexibility so as to get greater flexibility if you need it or less flexibility if you don't have to have it.

Q. And he says he does that by the position of the end of the slot with reference to the surface? A. That is one means.

Q. That is the means that is mentioned right there? A. He also mentioned web thickness and he mentioned skirt thickness.

Q. I am coming to that. I am just assuming all the other conditions to be the same. That is the fact, then, isn't it, that if you vary the extent of the slot through the center of the piston, you vary the flexibility of that skirt? A. That is correct.

Q. Now, we will come to the thickness of the web. Now, Mr. Jardine describes here specifically in the next sentence, and also in the preceding paragraph, the feature that these webs 25 of Fig. 9, or 6 of Fig. 4, decrease in thickness from the cylinder wall to the boss, is that right? A. That is correct, as shown in the drawings.

Q. And the greater that decrease in thickness, all the other conditions being the same, the greater will be the flexibility of the web? A. That is correct. And also the less the absolute thickness.

Q. You don't find any specific description of that kind in the Gulick patent, do you, I mean of the tapering or the decrease in thickness of the web? A. No.

Q. You don't find anything of that either in Plaintiffs' Exhibit 1, the Sterling type piston? A. No, I think not.

Q. You don't find any cutting in of the web towards the center of the piston in that Exhibit 1, do you? A. No.

Q. How much of a cutting in do you find there, in inches, from the cylindrical wall of the skirt towards the center of the piston? Oh, about,—it is not over an eighth of an inch, is it? A. (After measuring same) Exhibit 1 is 3/8 of an inch, approximately, in from the web. Of course what counts for flexibility is the distance to the outer diameter of the skirt.

Q. Where did you measure from; did you measure from this inside part to the part on the relief? A. I measured from half-way between the angular cut.

Q. Half-way to the relief? A. Yes.

Q. But you didn't measure from the half-way where the web turns in, where the web turns circumferentially? A. No.

Q. Those two points are just about on a line, are they not? A. That is something more than a quarter of an inch.

Q. And I suppose on an extreme relief, then, you would measure from the top of the keystone to the point of origin? A. What is the idea about where I would measure from?

Q. Well, I just want to know. A. Aren't we after flexibility in these skirts, webs and so forth?

Q. It is immaterial what you think. I want to know where you measured from in order to get that. A. That is according to what I want to find out.

Q. Well, if you want to get the length? A. No, if I want to get the flexibility—

Q. No, I want the actual length of the web. We will talk about flexibility later. The actual length of the web from where it is attached to the head to where the web ends. You said that is about a quarter of an inch; is that right? A. This particular web ends in the skirt, insofar as the structure of Plaintiffs' Exhibit 1 is concerned, as affects the flexibility.

Q. And I suppose if Mr. Jardine had a relief right out to the center, then you would measure from the point where the slot ends right out to the center of the relief? A. I would make the measurements which would be of importance in determining flexibility. When he makes a design to gain flexibility, then I should think it is flexibility we would be interested in.

Q. But the actual length of the web, now, where the web connects with the skirt, with the circumferential part of the skirt, is about a quarter of an inch in that Exhibit 1? A. From the inside of the piston, that is, from the point where the web is cut entirely through to the point where the relief ends, is something more than a quarter of an inch. Of course there is considerable flexibility, or some flexibility at any rate, in the web at the upper part where it comes down to the knife edge by virtue of the slotting operation which cuts the horizontal slots in the piston.

Q. Now, the Jardine patent structure, the thickness of the slipper from the center, that is where the split is, to where it joins the web, increases, does it not—the thickness increases from the center to where it joins the web? A. It does, as shown in the drawing.

Q. And you don't find that in Plaintiffs' Exhibit 1, do you, talking now from the part of the skirt from the split to where it joins what you call the web? A. It is difficult to say without a section, but I would assume that there is no taper there on the skirt.

Q. Now, you don't find any description in the Gulick patent as to definite proportioning of thickness of web to secure flexibility, do you? A. Yes.

Q. You mean a specific statement to that effect, that the web is proportioned to secure flexibility? A. Well, I will find what I had in mind on that point. (After examining patent) Beginning line 17, page 2, "The arrangement of the supporting flanges 17 between the ends of the piston pin bosses and the connections of those flanges with both the piston guide portion and the head provide a particularly strong construction, and at the same time, when the longitudinal split is used, as shown, the web structure has sufficient lateral flexibility to permit the split to close more or less under the action of the expansion forces incident to the heating of the piston."

Q. You think that is full and complete? A. Yes, that is a complete statement as to the function and mode of operation of those webs.

Q. Particularly from lines 24 to 27, isn't that right? A. Yes, when the longitudinal split is used; that is, from lines 23 to 27.

Mr. Bruninga: Well, just as part of the defense, in order to connect it up, I want to say that we will show that that was added by amendment.

Q. Now, you explained on your direct examination some peculiar action of flexing in the Jardine structure that I didn't quite understand. I understand the flexing of the webs all right, but I believe there was some peculiar structure that you described as the peculiar mode of operation from the head down, that is, when the head heated up, that there was a certain action took place. Can you elaborate on that a little bit, in other words, is there anything peculiar in the connection to the head that imparts particular virtue to that Jardine construction? A. Well, I mentioned two or three other

things besides flexibility which help to compensate for the extra expansion of the aluminum over the cast iron. One of those was the relief around the bosses permitting the piston to adjust itself to the cylinder wall by virtue of distortion. If the cylinder is round in cross section and the piston is round in cross section, then the expansion of the piston against the cylinder wall produces pressure at all points of the circumference and such pressure tends to make the piston rub too hard and eventually it may seize. If the piston is relieved on part of its circumference, then the pressure against the remaining part of the piston is available to help relieve the total pressure by distortion of the piston, the relieved portions having an outward movement. Now, that is helped also by the fact that you have the horizontal slots, that makes the distortion of the piston easier. Then there is also the factor of the excess expansion of the piston head causing the top of the skirt to expand more than usual as a result of its own temperature, and that I term mechanical expansion. In the Jardine construction that mechanical expansion would be one which normally should spread the slots farther apart. That would be resisted by the junction of the skirt or guide sections with the side walls of the cylinder, and the effect of it is to produce distortion in the piston, if there are no slots. If there is only one slot it also produces distortion and draws the bearing face inward, thus assisting with the clearance on that particular side. Now, if there are two slots it perhaps calls in a greater demand for the action of the flexible features of the skirt.

Q. As I understand, then, the characteristic features of such a construction in order to secure that result, are first reliefs opposite the wrist pin bosses? A. Yes.

Q. Second, some sort of a horizontal slot? A. Yes.

Q. Third, some sort of a vertical division or slot between the wrist pin bosses? A. Well, to get the maximum effect, yes, the vertical slot must be there. That is, in order to get the maximum compensation for excess expansion, the vertical slot must be there.

Q. And it is your position it don't make much difference whether it is a structure like Plaintiffs' Exhibit 1 in which there is a large relief, or whether it is a structure like Defendants' Exhibit BBB, of course slotted entirely through, in which there is the relief cut into the piston wall?

Mr. Richey: You are assuming Exhibit 1 is cut entirely through?

Mr. Bruninga: Yes, I am assuming they are cut all the way through.

A. Those two structures function substantially the same.

Q. And it don't make any particular difference whether the slot is on one side or both sides, the horizontal slot, one side or both sides of the piston? A. Well, it makes a difference, yes. There are other things that have to be taken into consideration if the slot, the horizontal slot is restricted.

Q. You say you would still have the advantageous features? A. Yes, you have a much more difficult problem in making an integral single-walled piston and making the structural changes necessary to compensate for the excess expansion, than you do in the double-walled piston. Many of the detail changes in the single-walled piston produce the same general effect but in somewhat different way.

Q. And it don't make much difference whether the vertical slot is exactly in the center of the skirt or not, exactly between the two wrist pin bosses in the center of the slipper, or exactly in the center between the two wrist pin bosses? A. Whether it is exactly in the center or not I think makes much less difference than it does whether it may be opposite the wrist pin bosses; that is, the slot should be between the wrist pin bosses.

Q. That is what is essential? A. Yes, in these constructions.

Q. That is your position when you consider this Jardine patent and what it teaches, taken in general and not in details like we are talking about? A. Yes, it teaches a broad principle. The Jardine patent, I think, teaches for the first time the means for getting a single-walled piston which by combining several features so as to compensate for the excess expansion especially at the top of the skirt, produces a result not theretofore produced.

Q. And what you have described is the structure of a piston like I am handing you now, marked for identification Defendants' Exhibit 3-Q? A. No.

Mr. Richey: If your Honor please, I want to make an objection to this. It is a question relating to something that wasn't inquired about in direct ex-

amination, and highly improper at this time. It is apparent that my adversary is going to contend that this is one of the prior art patents, that has not been referred to at all either in any of the patents in suit or in the direct examination.

The Master: Same ruling.

Q. Isn't this structure one which is relieved opposite the wrist pin bosses or can be readily relieved opposite the wrist pin bosses?

Mr. Richey: May I object to all this testimony regarding this particular thing, and may defendants' counsel be required to state how this thing has anything to do with the issues in this case? Is it pleaded as a defense, if so, what defense? To what issue made up by the pleadings does this relate? Certainly you cannot bring in anything, whether it relates to the issue or not.

Mr. Bruninga: Here is my position: this witness is not put on the stand as the ordinary shop man to come in there and explain structures, but he goes to the extent of saying, again and again here, that is just a detail, it contemplates other things. Now, when he takes a position like that, I can face him whether it covers this or not. It is just too bad if it happens to be a prior art device. And the position is taken here that the patents cover two diametrically opposed pistons, the Ray-Day and the Sterling type. These are stretched to the breaking point, and where plaintiff takes a position like that I can certainly cross examine this witness right now whether he intends to include anything like that. This is not the ordinary case at all.

The Master: I am going to permit the cross examination. You can have your exception to it. If it is improper it can go out at a later time.

Mr. Richey: Will he be required to say if this relates to the prior art construction? What he says simply is in any case you can go outside of the issues.

The Master: No, that is not the point. This man comes here as an expert. He testifies as to certain principles. It seems to be he can be controverted with questions concerning those principles, and that is what this is.

Mr. Richey: Even though they are outside of the direct examination and the specific issues?

The Master: I don't say they are outside. I don't think they are outside.

Mr. Richey: He talked definitely about the patents in suit and the devices charged to infringe.

The Master: I am going to let it in; you may have your exception.

A. (After question is read) It can be readily relieved opposite the wrist pin bosses.

Q. But as far as you can say that particular model is not relieved opposite the wrist pin bosses? A. No.

Q. But it does have a horizontal slot between the wrist pin bosses on each side? A. Yes, and above the bosses.

Q. And it has at least one vertical slot between the wrist pin bosses, connecting it with that horizontal slot? A. No, it has no vertical slot.

Q. Oh, it has no vertical slot? A. No.

Q. Why, because the slot don't go all the way through? A. That is correct.

Q. And you make that distinction? A. I certainly do.

Q. You make that distinction that the slot which don't go all the way through is not the same as one that goes all the way through? A. No, I make the distinction that a vertical slot for the purpose of gaining flexibility must serve that purpose, and these "accordion pleats" in that piston do not serve that purpose; in fact, they are strengthening ribs, that is about what they are.

Q. It is your position, then, that they don't impart any flexibility to the skirt? A. Practically so; that is practically as rigid as a trunk type piston.

Q. That is your position? A. Yes.

Q. Even if it has relief opposite the wrist pin bosses? A. That makes no difference in the rigidity.

Q. Not a bit. But the skirt is separated from the head at least 180°, isn't it? A. Approximately, yes.

Q. About as much as in Plaintiffs' Exhibit 1? A. Yes.

Q. But your position is that this particular piston is just as rigid as an ordinary trunk type piston? A. Practically so. I have measured them.

Q. Did you ever measure this one? A. No, but I have measured pistons that have that construction.

Q. And a description that would state that it is flexible, would then be wrong? A. Yes, it is wrong, any

description which says that piston is flexible laterally is wrong.

Q. Dr. Jeffries, you were retained to expert the Simmons suit, were you not? A. No.

Q. You weren't? A. No.

Q. Don't know anything about it? A. Yes.

Q. You know of course a patent describing that structure was included in the Simmons case, don't you? A. Yes, certainly.

Q. You also know, or rather counsel has admitted, this particular piston here was alleged to be an infringement of that patent? A. I don't know that.

Q. Counsel has admitted that. You disagree, then, that this piston don't have any of the characteristic features of that piston (referring to Defendants' Exhibit 3-Q and Plaintiffs' Exhibit 1)? A. Did I say that?

Q. Well, I am asking you. A. I don't know.

Q. It does not have the flexible feature, does it? A. No.

The Master: The 3-Q, what do you call that?

Mr. Bruninga: Call it the ribbed piston.

Mr. Richey: You know what you call it.

Mr. Bruninga: It is known as the Franquist piston?

The Witness: Yes.

Q. Wasn't that piston used in the Pierce-Arrow car—I am not asking you about the date? A. I don't know. That would mean nothing. A trunk piston was used in a Pierce-Arrow car, too.

Mr. Richey: You claim it is made after the Franquist patent 1,153,902, in the prior art?

Mr. Bruninga: Yes.

Q. Doctor, did I ask you to bring in a Ricardo piston? A. No.

Q. I thought I had. A. I didn't recall you had. I brought in everything you asked me.

Q. I will take your word for it. Wasn't that Ricardo piston used in the Dodge automobile a number of years ago? A. Not that I know of.

Mr. Richey: Now, are you referring to the piston shown in Ricardo patent 1,294,833? Let's find out what you mean by the Ricardo piston.

Mr. Bruninga: I thought the witness knew.

Q. Since he hasn't produced a piston I will ask him whether the Ricardo piston is properly illustrated in patent 1,294,833?

Mr. Richey: Properly illustrated, how does he know? What are you talking about? Are you talking about the one in this patent?

Mr. Bruninga: Whether the Ricardo piston we talked about yesterday is illustrated in that patent.

The Witness: Yes.

Q. You can answer that, can't you? A. Yes.

Q. Who are now using pistons illustrated in the Maynard patent, what automobiles? Are all of those using the piston that you mentioned, or don't you remember which ones you mentioned? A. Well, I couldn't give you a list, but the information I suppose would be obtainable.

Q. Well, some of those that have used the piston illustrated in the Maynard patent have quit using it? A. Yes.

Q. Including Chrysler? A. Oh, I think Chrysler has not quit using it. They are using a different design of piston in their new models.

Q. Not a single one of these General Motors cars uses an aluminum piston at all? A. Not the pleasure cars.

Q. The trucks do? A. Yes.

Q. And they use the straight non-split piston of what kind? A. I don't know what kind they are using.

Q. Now, you mentioned there were only a few people that were manufacturing pistons made in accordance with the patents in suit outside of the licensees, of which you mentioned Sterling and Ray-Day, and some people on the coast. How about Thompson Products Company? A. They are not manufacturing these pistons to the best of my knowledge.

Q. Not even selling them? A. Oh, yes, selling pistons.

Q. Selling pistons made by licensees or by non-authorized persons? A. They are selling pistons made by the United States Aluminum Company. Beyond that I don't know.

Q. Did you know there was a suit filed in this district and a consent decree entered against Lawrence-Ohio Company, one of the vendees or jobbers of the Ray-Day pistons? A. Yes.

Q. Do you know that there is a suit now pending in Detroit against the Ray-Day Company? A. No.

Mr. Richey: There is, we concede that.

Q. Have you found motor car companies very anxious to avoid infringement suits? The fact is that they don't like to get into infringement suits, motor car companies? A. I don't know whether I can make any general statement on that subject.

Q. Well, you know the position of the motor car companies in the industry that have put out thousands and thousands of cars, sometimes thousands per day, each having from four to sixteen pistons, do you find that they take chances on infringement, in your contact with that industry? You seem to be familiar with the automobile industry and what their attitude is. A. Some of them take chances, I am sure of that.

Q. Has any automobile manufacturer taken a chance in any piston suit in the last 20 years, to your knowledge? A. Yes.

Q. What company? A. Ford, for example.

Q. On a piston? A. Yes.

Q. What piston was that? A. The Sterling piston.

Q. The Sterling piston, you mean the piston we have here now? A. Yes.

Q. Exhibit 1? A. Well, I don't know whether it is exactly like Exhibit 1.

Q. Has Ford been notified of this suit? A. I don't know.

Q. Well, have they taken a chance to defend any suit at all in the courts? A. I don't know.

Q. You don't know of any motor car company that has in the last 20 years taken a chance to defend a suit on a patent involving a piston?

Mr. Richey: I object to this as immaterial.

The Master: He may ask him if he knows.

A. Yes, I think I can say that I do.

Q. Which one? A. All the ones that started to use the Invar Strut piston in the earlier days.

Q. And a suit actually filed against them? A. I don't think suits were filed against them but they took a chance.

Q. Well, it wasn't even necessary to litigate that patent in the courts against a motor car manufacturer, was it, on the strut piston? A. No, it wasn't necessary, or hasn't been, at any rate.

Q. And by the strut piston you mean this piston, Exhibit AAA? A. Yes, that is one of the Strut patents.

Q. You didn't mention Mr. Long as being one of the parties who operated in defiance of the patents in suit. You know that Long and his company has operated in defiance of the patent in suit? A. No, I didn't know that.

Q. You didn't know that a suit was filed against Mr. Long by Cleveland Trust Company and the Long Piston Company in Detroit a number of years ago? A. No.

Q. You don't know that that was dismissed, either, do you? A. No.

Q. You don't know that it involved any patents in this suit? A. No.

Q. Aluminum Manufacturers was formerly the Kant-Skore Company? A. No, Aluminum Industries.

Mr. McCoy: Aluminum Industries, Incorporated.

Q. Aluminum Industries, Incorporated, is simply the old Kant-Skore Company with the name changed? A. I think there was an enlargement of activities when the name was changed, but it is the successor company of the Kant-Skore.

Q. And that company took a license under the Cleveland Trust Company patents after the settlement in Cincinnati in 1923 of the mold patents? A. I think so.

Q. And those molding patents are the same ones involved in the St. Louis suit with the exception of the few additional ones in the Kant-Skore case? A. Some of the molding patents were the same.

Q. And the license under the molding patents, and the license under these Cleveland Trust patents were given to Kant-Skore just about the same time? A. I don't know the dates.

Q. But after the settlement of that suit? A. Yes.

Q. And Bohn Aluminum & Brass Company also took a license under both sets of patents after the Kant-Skore suit was settled? A. Yes.

Q. And you happen to know that Mr. Bohn's attorney represented Kant-Skore at that trial? A. I think so.

Q. Now, as I understand it, then, there are these licenses; there is Aluminum Industries, formerly the

Kant-Skore Company, Bohn Aluminum & Brass Company in Detroit, and United States Aluminum Company, which is a subsidiary of Aluminum Company of America, and Aluminum Company of America; am I right? A. Those are the licensees under the Cleveland Trust patents.

Q. Under the Cleveland Trust patents? A. Yes, I think the direct licensees are the Aluminum Company of America and Bohn Aluminum & Brass Corporation, and that Aluminum Industries is perhaps a sub-licensee of the Aluminum Company of America. I don't know just how that is.

Q. In other words, as you remember it, it is a round-about license from Cleveland Trust Company to Aluminum Company of America, and then to the Aluminum Industries, Incorporated? A. I think Aluminum Industries is a licensee from Aluminum Company of America.

Q. And Bohn bought the licenses of National Piston Company and Levett & Company? A. I think so.

Q. And both the National Piston Company and Levett & Company were licensees under the Cleveland Trust Company patents? A. I think so, yes.

Q. Did Bohn take a direct license, do you know? A. I don't know. I think he has a direct license.

Q. It has been the practice for these licensees on pistons to assign their patents to Cleveland Trust Company; that has been the practice, hasn't it? A. It is with the Aluminum Company of America. I think some provision was made for the others as well, I am not sure.

Q. Well, you don't know of any patents that Aluminum Industries hold? A. In their own name?

Q. In their own name? A. No, I do not.

Q. You don't know of any split piston patents that Bohn Aluminum & Brass Company holds in its own name? A. No, I don't know of any specific ones.

Q. It never has been necessary to split the cast iron piston, has it? A. I think not, it has not been absolutely necessary; it might be helpful in some cases, I am not sure.

Q. The Exhibit 3-H is practically a piston as used today? A. Yes, I think it is.

Q. And the reason it has not been necessary to split a cast iron piston is that the coefficient of expansion of cast iron is so much lower than aluminum it don't really enter into play? A. That is correct.

Q. And the piston operates in engagement with a cylinder which is also cast iron, therefore has the same coefficient of expansion as the piston? A. Yes.

Q. So you rather would not expect any compensation for expansion in the cast iron piston except that due to the greater heat applied to the piston as distinguished from the cylinder? A. That is correct.

Q. And it was not until aluminum pistons came into use that it was really necessary to compensate for expansion? A. That is correct.

Mr. Bruninga: Now, that finishes my cross examination of this witness. With reference to the production of the licenses, that might be taken up in connection with this matter of Chrysler, if you want to proceed with this witness right now, if I can do so. I want those licenses produced, and I think I have a right to have them produced. I can't take this witness' or any other witness' word for the fact royalties have been paid until I know what the condition of the payment is.

(Short recess taken.)

Re-Direct Examination by Mr. Richey.

Q. In connection with your answer to the last question of the cross-examiner regarding the necessity of flexibility in the aluminum piston when it arose, will you explain just when that necessity did arise and how long before it was worked out, as far as you know? A. Well, it was a problem in 1915 when I first became connected with the Aluminum Castings Company and it was a problem continuously on pleasure car vehicles until it was solved and the real solution of it didn't come until, oh, approximately 1920, and commercially not until a while after that, what might be called a real commercial success, with a means for compensating for the extra expansion of aluminum.

Q. Now, you were asked about your relative position in the suit on these patents here involved and those involved in the suits in St. Louis and San Francisco. Will you state, succinctly, what your positions are or were with respect to the contributions made to the success of aluminum pistons by those two groups of patents? A. The groups of patents in suit in the St. Louis and San Francisco cases were for molds, processes for making hard, sound, tough, durable piston castings and the product so produced. The position I took in connection with

the so-called mold process and piston casting patents is that they were the developments which made possible the commercialization of the aluminum alloy piston. They did so because of the soundness, high strength of the metal resulting from this special method of casting, and in the chilling when certain families of alloys were used. That is the process as has been testified to in the other suits, under which more than a hundred million pistons have been made in the United States alone since 1915. That is the method by which practically all of the pistons made and used today are produced. Now, in this particular case, this represents an additional group of patents relating to the design of the piston and to methods for compensating for the excess of expansion of aluminum as compared with cast iron for the purpose of making the aluminum alloy piston function properly as regards bearing, oil pumping, slapping, sticking and so forth, so that full advantage can be taken of its lightness and its high heat conductivity and of the properties imparted by these other processes of which I spoke.

Q. And it was some years after the processes, molds and so forth involved in the first suit were worked out before this scheme for taking care of the compensation employed in the patents in suit was worked out commercially? A. Yes, to a satisfactory solution or result.

Mr. Richey: As preparatory, I might say I examined this witness regarding the prior art, which defendants' counsel asked him about, without waiving my right to go into it in rebuttal.

Mr. Bruninga: You understand I don't waive.

Mr. Richey: We have a different situation. You have gone into prior art when you have no right to do it. I am not going to leave the thing open, at the same time I am not going to waive my right to take testimony in rebuttal in regard to it.

The Master: I understand the situation; you may proceed.

Mr. Bruninga: I just don't want to waive any position I have.

The Master: All right, proceed.

Q. You were asked about the Ricardo piston and the work done upon it or in connection with it. You were connected with the predecessor of the United States Aluminum Company along in 1915 and up, weren't you? A. Yes.

Q. You have spoken of the difficulties with the trunk type aluminum piston. Do you know what if any efforts the United States Aluminum Company or its predecessor or associated companies made to try to find a solution for that situation? A. Yes.

Q. Will you just tell us what those efforts were, and when they began and what were the results of them? A. The efforts were continuous from the time that I became connected with the Aluminum Castings Company in 1915. Not only were they continuous but they were strenuous. We heard of various designs of pistons in various ways to take care of the excessive expansion, and a number of such things were tried out and a number dismissed as seeming impractical, and that was a problem that was continuously before the Aluminum Castings Company between 1915 and the end of the war. The war activities minimized the international exchange of ideas, as everyone knows, but shortly after the war was over, namely, early in 1919 or approximately late in 1918, I recall the beginning of interchange of international ideas on the subject. After a survey of what was available abroad and the information that had been gained over there, it seemed to us that the Ricardo piston perhaps represented the best that they had to offer from abroad. There were three engineers in the United States from England shortly after the war, all of them interested in exploiting the Ricardo piston in the United States. One of those is an internationally famous automotive engineer, Lawrence Pomeroy. Another man who appeared to have the business negotiations as his responsibility, was Major Halford, but he also represented himself as an engineer. Another engineer by the name of Parnell, as I recall his name, was in this country for the purpose of handling the details of testing and installation of the Ricardo pistons. The Aluminum Castings Company was in contact with these gentlemen and tried out the Ricardo pistons early in 1919. The laboratories at Harvard Avenue were almost turned over to the piston problem in the Spring of 1919. It seemed that there was little time in the dynamics laboratory, at any rate, for anything else but piston tests. These Ricardo pistons were made under the supervision of the Ricardo representatives and tested partly under their supervision and partly under our supervision. The tests were exhaustive. There was considerable impatience on the part of the Ricardo representatives with reference to the delay in approval by the

Aluminum Castings Company or its successor. I just don't remember the date of the incorporation of the Aluminum Manufacturers, Incorporated, but that makes no difference, because my relations at any rate did not change over there, neither did those of a number of other people in the laboratory. The Ricardo pistons, however, were unsuccessful. If fitted closely enough to avoid noise, they seized. If fitted loosely enough to avoid seizure, they made noise; and there was also trouble from oil consumption. As I recall it, every expedient for making the pistons work was tried out and still the pistons were not successful. The solution appeared to be at hand with the Jardine piston, and after that the direction of work in the Aluminum laboratories has been largely along refinement, perfection and change of the flexing method, and also in the direction of the utilization of the Invar Strut.

Q. By reference to the Jardine piston, you mean the piston of the Jardine patent in suit here? A. Yes.

Q. Now, who was Harry R. Ricardo? A. He is quite a noted English automotive engineer.

Q. And was he prior to the time his patent was taken out? A. Yes.

Q. Now, who was trying these expedients to make this Ricardo patent work? A. Both Mr. Parnell, representing him, and Mr. Jehle, who was in charge of the tests.

Q. That is Mr. Ferdinand Jehle, now an engineer with the White Motor Company? A. Yes.

Q. And he was a well known engineer at that time, too, was he? A. Yes.

Q. Anybody else there working on the problem, observing the tests? A. Yes, Mr. Wesley, Mr. Carpenter, Mr. Allyne and Mr. Blank, who is also an automotive engineer with the White Motor Company, Mr. Jardine, as well as myself.

Q. Mr. Welty there also? A. I think he was not there at that particular time.

Q. And those people you have named are automotive engineers, aren't they? A. Not all automotive engineers, no.

Q. Well, many of them were, weren't they? A. Yes.

Q. Mr. Pomeroy also? A. Oh, Mr. Pomeroy, yes.

Q. Mr. Parnell? A. Mr. Pomeroy was actively interested in the tests and also Mr. Parnell.

Q. What kind of tests were made on the Ricardo piston? A. Engine tests, the tests that I have named were made in the laboratory, but pistons were also fitted to motors in cars.

Q. That is the usual indoor and outdoor tests? A. Yes.

Q. Over what period of time were these tests made? A. The tests were going on rather actively in, I should say, it was a period of four or five months at any rate.

Q. Now, you were asked about the commercial use of the piston of the Jardine patent. Will you state what was done towards developing that piston for commercial use after it was first invented by Mr. Jardine? A. There was an attempt to commercialize the Jardine piston in the slipper form and tests were under way in a number of places, both laboratory and road tests, and the piston was receiving favorable consideration. I don't recall the exact date but I do recall an instance of tests in the Templar car here in Cleveland, which were quite satisfactory. But by the time the Jardine piston was found to be satisfactory from the standpoint of taking care of clearance, as mentioned yesterday, the Maynard piston became available and it was a preferable construction.

Q. And it was elected to push the piston shown in the Maynard patent instead of that in the Jardine patent? A. That is correct.

Q. How far had these tests on the Jardine piston gone with respect to the commercial utility? A. So far as I recall, the effect on the organization, on the inside, was that we felt the problem had been solved and it was only a question then of the proving in in the field, and that proving in had gained considerable headway by the time the Maynard piston came along and proved in still better.

Q. Will you compare this piston shown in this Ricardo patent 1,294,633, in structure, mode of operation and results, with the pistons of each of the patents in suit? A. Considering first the Gulick patent, the construction shown in the Ricardo patent is not the same as that shown in Gulick, although it does have some similarity in that the web are depending from the head portion proper in which the wrist pin bosses are mounted. The skirt construction is quite different from that shown in Gulick, and the method of operation is different, in that Gulick shows flexibility of the skirt and Ricardo does not. The

result is different because Gulick gets compensation for extra expansion and Ricardo does not.

In so far as the Jardine construction is concerned, that shown in Figs. 1 and 2 is quite similar to that of Ricardo. The web sections of Ricardo are considerably thicker than those of Jardine. The Ricardo piston apparently is made for rigidity and stiffness, where the Jardine construction is made for rigidity only in the vertical direction, but is made for flexibility in the lateral direction. In so far as mode of operation is concerned, the mode of operation is different in the Jardine patent from what it is in the Ricardo construction, because Jardine is designed to operate by utilization of the flexible webs and skirt and Ricardo is not. In so far as result is concerned, the Jardine attains the result which the Ricardo does not. The Ricardo cannot be fitted closer than the trunk type of piston, for example, whereas the Jardine construction can be fitted in the cylinder much more closely. The construction, even in the Jardine Figs. 6 and 7 is different from that shown in the Ricardo patent. This is a matter of history on that point, I might mention that the construction shown in Figs. 6 and 7 of the Jardine construction was capable of being manufactured in a permanent mold. Now, the Ricardo construction is not, or at least was not at the time, with the molding art available but nevertheless the Aluminum Castings Company had in mind that they could not put an aluminum alloy piston on the market and make it successful unless it were cast in a permanent mold. The Ricardo people insisted, however, on this type of construction as shown in the Ricardo patent, as having peculiar advantages and insisted that unless we utilize that construction we did not have a Ricardo piston. So that the construction shown in Figs. 6 and 7 of Jardine is different from that of Ricardo by virtue of the direct connection of the webs to the bottom of the ring flange rather than the connection of the webs to the head of the piston. The Ricardo construction is, then, in part a two-walled structure, whereas the Jardine construction shown in Figs. 6 and 7 is a single walled construction.

In so far as the Maynard patent is concerned, the construction is different from Ricardo, the mode of operation is different and the result is different.

With respect to Mocera, the construction is of course different but the Ricardo piston has relief around the bosses and it has separation of the skirt from the head,

so that the Ricardo piston might be capable of some distortion and it might also have its skirt temperature reduced somewhat at the top in the center of the thrust faces, utilizing the principles outlined in the Mooers patent.

Mr. Richey: Just a minute, I withdraw that part of the question that refers to the Mooers and Schmiedeknecht patent because I see the Ricardo patent is subsequent to those two in filing date.

The Master: You want to strike that out?

Mr. Bruninga: No, I don't think it ought to be stricken out. It is pertinent here. I think counsel has a right to withdraw as to Schmiedeknecht but the witness has already answered with respect to the Mooers patent.

Mr. Richey: All right, I will withdraw only with respect to Schmiedeknecht.

Q. You were asked this morning about the slots as shown in the Jardine patent in suit at 11a in Fig. 1 and 29a in Fig. 6, and in Plaintiffs' Exhibit 1. Will you state whether or not any modifications of operation, resulting from the difference in the length of these slots, would be a matter of degree or matter of kind? A. It would be a matter of degree.

Q. You were asked yesterday to produce specimens of pistons made under the patents in suit in which the edge of the relief was straight instead of inclined, and produced the two unfinished castings, Exhibits 3-M and 3-N. Will you state why you did not produce finished castings? A. The finished castings were not available, I couldn't locate them.

Q. Have you produced drawings which show the piston which is finished from these two castings? A. These two drawings have just come in and I have not had an opportunity to compare them with the pistons as yet. Drawing D-2376 X—

Mr. Richey: Marked for identification Plaintiffs' Exhibit 21.

A. —appears to be the drawing of the finished piston, of which Defendants' Exhibit 3-N is an example. The drawing and the piston both have the same number, namely, 481,678.

Mr. Richey: The next drawing I mark for identification Plaintiffs' Exhibit 22.

A. (Continued) This drawing is also one for the finished piston of Defendants' Exhibit 3-M, both the drawing and the piston have the number 323,135. The number of the drawing is D-2460-X.

Q. Were the pistons illustrated in the drawings marked Exhibits 21 and 22 made and sold? A. To the best of my knowledge, yes.

Q. In substantial quantities? A. Yes.

Q. Now, those, each drawing shows this line vertical, does it not? A. Yes.

Mr. Richey: I offer these drawings in evidence as Plaintiffs' Exhibits 21 and 22.

Q. The line to which I referred in the next preceding question as being vertical, was the line showing the boundary between the web and the thrust faces, which I mark XX in each of the pistons. That is the same line you referred to in your answer to that question? A. Yes.

Q. I show you this large drawing of Ray-Day pistons, being marked for identification as Plaintiffs' Exhibit 23. Will you compare that with Plaintiffs' Exhibit 8, the Ray-Day piston? A. That is a drawing of the piston similar to Plaintiffs' Exhibit 8. The bottom drawing shows the piston with part of the head and part of the skirt removed.

Mr. Richey: I offer that large drawing in evidence as Plaintiffs' Exhibit 23.

Q. Now, you were asked about the litigation over these process, mold, etc. patents, and about the Kant-Skore suit. Was that suit tried? A. Yes.

Q. You were asked about the automobile companies taking chances on patent suits. Do you know anything about their organization with respect to the National Automobile Chamber of Commerce? A. Not enough to testify about it.

Mr. Richey: It has been agreed that the witness may cut through the slots of Plaintiffs' Exhibit 1 and Defendants' Exhibit BBB, in order to make them as actually used. I produce a hack saw and ask this witness to do that.

Mr. Brusinga: I am willing to delegate this witness to do so.

Q. Will you compare Defendants' Exhibit BBB as if the slots were cut through, in the structure, mode of oper-

ation and results, with the piston disclosed in each of the patents in suit? A. What I said with reference to Plaintiffs' Exhibit 1, assuming the slot is cut through, and Plaintiffs' Exhibit 17, with reference to the patents in suit, applies to Defendants' Exhibit BBB, with this understanding, that the extension on the inside of the piston above the bosses serves as the connection between the piston head and the piston skirt the same as the web connection in Maynard and in Plaintiffs' Exhibit 1. The extensive, and considerable relief of the skirt portion around the bosses is the equivalent insofar as function and mode of operation are concerned, to the web of Maynard. The construction is in my opinion an impairment of Maynard inasmuch as the bosses are not mounted as rigidly as in Maynard and the skirt section is made extra thick so that the skirt around the bosses can be cut away for relief. The skirt sections are therefore thicker than need be, or thicker at least than would be required in the Maynard construction. The Defendants' Exhibit BBB is more nearly like the Mocers construction at the top of the skirt because of the short connectors and the relief opposite such connectors. I would not say that Defendants' Exhibit BBB had anything to do or anything in common with the Schmiedeknecht patent.

Mr. Bruninga: I am perfectly willing to stipulate that the same defendant that sells Defendants' Exhibit BBB also sells Defendants' Exhibit CCC.

Mr. Richey: You mean they sold it between the date of the issue of the youngest patent in suit and the filing of the bill of complaint?

Mr. Bruninga: I don't know whether it was prior to the filing of the bill of complaint, but I understood it was sold since. If you want to have it before the Master I am perfectly willing to have it in the case so as to settle all these difficulties between these parties.

Mr. Richey: Well, I think I will defer my answer until I can make it complete, that is, I would like to take it with me this week-end.

Mr. Bruninga: I am perfectly willing you should do that, Mr. Richey.

Q. You were asked about Mr. Jardine and Mr. Maynard and their position as engineers. Will you state what their positions were in the automobile industry as engineers back in 1920 and '21 and along there? A.

Frank Jardine was automotive engineer for Aluminum Manufacturers, Incorporated, specializing on pistons at the time, and I can give that information from my own knowledge. My information with respect to Mr. Maynard is not from my own knowledge. I understand, however, that he was an automotive engineer for the Maxwell Company.

Q. Is there anything in the pistons of the Jardine patent in suit which back up the thrust on the thrust faces, particularly the faces on which the maximum thrusts come? A. Yes, the webs are located in such a position as to support the piston during the side thrust and also one of the slippers is made larger than the other, and it is the intention that the slipper with the largest face shall be used in the position of maximum thrust in the motor.

Q. Do you know why Exhibit 20, the Gulick piston produced by you, was made of that particular size, and if so state why? A. I can't say of my own knowledge why it was made of this particular size, but I think the record is pretty clear in the interference proceedings that it was actually made for an Oakland motor and it can be seen that it is the same size at the Oakland piston casting, Defendants' Exhibit 3-N. To the best of my knowledge this is a piston for a motor which was commercial at the time it was tested, namely, the Oakland motor.

Mr. Bruninga: I have no objection with reference to this piston produced on cross examination and offered in evidence because the matter of ex parte tests simply goes to the weight, not to the admissibility of the evidence at all. I understood there don't have to be any objections as to the weight of the evidence.

Mr. Richey: Well, we won't seek to take any advantage because you have delayed your objection. We are willing it should stand just as though you had made it at the proper time.

Mr. Bruninga: I would like to ask one question. In the Eighth Circuit it is not necessary to take exception to the rulings in an equity case. I understand that is the general rule in the United States. I don't know whether it is necessary here or not before the Master.

Mr. Richey: I understand that is the rule. If it is not, we are willing to agree we don't have to

take exceptions, and it will be understood we take one wherever the ruling is against us.

The Master: That is as I understand it. Where there is an objection as to a line of testimony, I understand that same objection continues and the same ruling throughout the case, without repeating so that it encumbers up the record.

Q. What if any effect would there be on the mode of operation and the results of Exhibit 20 if the size of the piston was changed within the limits of sizes of automobile pistons used in the industry, and assuming the proportions were kept the same? A. The larger the piston, the easier it is to be made flexible, so that the fact that this piston is small and flexible as no indication that it could not be made flexible if it were made larger. In fact, it would be somewhat easier to make it flexible if it were made larger. I don't mean necessarily it would flex with less actual force. Of course there would be more force used in the larger piston to make it flex.

Q. What if any changes would there be in the operation and results of making it larger? A. None excepting possibly in degree.

The Master: I think we will have to adjourn here.

(Adjournment taken to 9:30 A. M., Monday, January 23, 1933.)

(At 9:30 A. M., Monday, January 23, 1933, the hearing was resumed.)

(Same appearances as last noted, except Mr. McCoy absent, and John Sutherland, Esq., of St. Louis, also appearing with Mr. Bruninga for defendants.)

Mr. Bruninga: I admit that since the issue of the latest patent in suit, the defendant F. E. Rowe Sales Company have sold in this district pistons exemplified by Defendants' Exhibit CCC; that these pistons have been furnished and supplied to customers in this district with the skirt completely slotted through, or with the slot partially completed, in the same manner as shown in Exhibit 7, with directions to the customer like those given on Exhibit 7 to complete the slot; it is agreed that the above acts may be treated with the same force and effect as if they were committed before the filing of the

bill in the Rowe case herein; I am also willing to admit that if F. E. Rowe were called as a witness he would testify under oath that such pistons were purchased by his company of Sterling Products Corporation of St. Louis, and that when so purchased the slot was incomplete and he received instructions from Sterling Products Corporation to complete the slot or have it completed before the pistons were used, all as if between the date of the youngest patent in suit and the filing of the bill in the Rowe case. This last part being, however, subject to the motion to strike and expunge when the master passes on the main question.

I also admit the same with reference to Defendants' Exhibit 3-J, with the same reservation.

Mr. Richey: In view of the above admission, plaintiffs and each of them charge that Defendants' Exhibit CCC infringes the following claims of the following patents in suit:

That Exhibit CCC infringes the same claims of the Gulick patent as Exhibit BBB, as previously announced.

Exhibit CCC infringes claims 1, 8 and 10 of the Jardine patent.

Exhibit CCC infringes claim 6 of the Maynard patent.

Exhibit CCC infringes claims 3, 4, and 11 of the Moore patent.

We make no charge of infringement of any claim of the Schmiedeknecht patent by Exhibit CCC.

These charges of infringement are made without waiving our right to assert in future suits and otherwise any claims under any other patents which the plaintiffs or either of them may now have or later acquire, and which are not included in this suit.

With respect to Exhibit 3-J we reserve our announcement until we have time to go over this matter carefully. I understand that my brother on the other side agrees that if we cannot announce our position with respect to Exhibit 3-J during our prima facie case we may later amend the prima facie case to include it, with the permission of the court.

Mr. Brumingn: I would like to have that done before defendants close their case.

With reference to the reservation made by counsel, that of course depends upon circumstances about

which I may know nothing. Counsel can announce his reservation, but I don't want to be in a position where I acquiesce in it at this time.

I mark for identification as Defendants' Exhibit 3-R the half section of the piston or rather a model showing the construction of the Gulick patent, which was produced during the examination of Dr. Jeffries on cross examination.

Mr. Richey: All these arrangements are all right with the court, are they?

The Master: Yes.

Mr. Richey: I think the record ought to show that by agreement the slots in Exhibits 1 and BBB have been cut through with a hack saw so as to complete them. This work was done between the last session and the present session.

Mr. Bruninga: That is correct. I want to further agree that Dr. Jeffries may be delegated to complete the slots in other pistons in which they have not been completed and which are on exhibit.

Mr. Richey: You haven't said on the record you agree to amending our prima facie case if necessary. I understood you did agree.

Mr. Bruninga: Oh, yes.

The Master: He agrees to it with the reservation that he would have the chance to answer.

Mr. Richey: Oh, yes, certainly.

Mr. Bruninga: I understood that evidence with reference to Exhibit CCC was to be put in before we close our case.

Mr. Richey: CCC but not 3-J.

Thereupon RAY JEFFRIES resumed the stand for further RE-DIRECT EXAMINATION by Mr. Richey.

Q. Will you compare the piston illustrated and described in the Spillman & Moore patent 1,002,870, in structure, mode of operation, and results, with each of the pistons illustrated and described in each of the patents in suit? A. Considering the comparison of the Spillman & Moore construction with that shown in the Gulick patent in suit, the two constructions are the same or similar with respect to the separation of the head portion of the piston and the skirt portion by horizontal slot between the head and the skirt. They are also the same in respect to the attachment of the head to the skirt, in

that both skirts are attached to the head proper, rather than to the ring flange of the head. They are also both similar in that the wrist pin bosses are mounted in webs rather than on the skirt or guide section proper. The means of attachment of these webs in the Gulick construction permits of rigidity in a vertical direction and of rigidity in one direction laterally. The Gulick webs, however, are flexible in the other lateral direction, which flexibility permits the opening and closing of a vertical slot in the skirt of the Gulick piston. These webs in the Gulick construction are designed to produce such flexibility. There is no vertical slot in the skirt or guide section of Spillman & Mooers, and the web construction joining the head and the skirt and supporting the wrist pin bosses does not provide for such flexibility. That is, the Spillman & Mooers construction is designed for rigidity rather than flexibility. There is a difference also in the attachment of the webs both to the head and to the skirt. In the Spillman & Mooers construction the head is attached to the skirt by means of an annular web in contact with the head, and the web extends nearly to the bottom of the skirt and attaches to the skirt in a horizontal plane. There is no attachment in the Spillman & Mooers between the junction of the webs near the bottom of the skirt and the top of the skirt itself. In so far as mode of operation is concerned, the two pistons function differently. The Spillman & Mooers piston is designed to operate without flexibility of the skirt. The intention is to keep the top of the head portion cool as a result of the poor heat conduction across the air gap at the horizontal slot. There is no provision for either cooling or flexibility at the bottom of the skirt in the Spillman & Mooers. The mode of operation of Gulick is dependent on the flexibility of the skirt. This flexibility is gained as the result of both the horizontal slotting and the vertical slotting, as has been described before. The result is also different. The Spillman & Mooers construction can not be fitted as closely in the cylinder as the Gulick construction.

With reference to the Jardine patent, there is very little in common even in construction with the Spillman & Mooers construction. In one of the Jardine constructions, as shown in Figs. 1 and 2, the head is attached to the guide section by means of webs directly attached to the head, but such webs more nearly correspond to the Gulick webs than to the Spillman & Mooers webs. In so

far as the constructions shown in Figs. 6 and 7 of the Jardine patent are concerned, there is little in common between Jardine and Spillman & Mooers. The Jardine construction is designed to compensate for extra expansion at the top of the skirt by utilizing several methods of compensation, including flexibility of the skirt and web. The mode of operation of the Jardine construction is therefore different from that of the Spillman & Mooers. In so far as result is concerned, the Jardine construction gives a different result from that of Spillman & Mooers, and when aluminum is used for the piston material it gives a superior result in so far as fitting is concerned.

There is very little in common in construction between Maynard and Spillman & Mooers. Maynard attaches the skirt portion to the flange portion of the head, and the operation at the top of the skirt is substantially the same as described for Jardine, which is different from that of Spillman & Mooers. The Maynard construction therefore has a different mode of operation from that of the Spillman & Mooers. In so far as result is concerned, the same as was said of Jardine can also be said of Maynard as compared with the Spillman & Mooers construction.

The difference of construction between that shown in the Mooers patent in suit and the Spillman & Mooers, is described at some length in the Mooers patent specification itself. The Mooers construction is a single walled body, whereas the Spillman & Mooers is double walled throughout the greater portion of the height of the piston; and the Mooers construction is lighter and it is simpler and capable of being manufactured in a permanent mold. The mode of operation is partially the same and partly different. The point of similarity is that of the separation of the head from the skirt by horizontal slots which will tend to keep the top of the skirt cooler than if the horizontal slots were not present. In so far as this cooling effect is concerned, it is similar to that attained in the Spillman & Mooers construction. In the Spillman & Mooers construction, however, there is no provision for distortion of the top of the skirt and there is no relief of the skirt section at the top where the need for clearance is greatest. The Spillman & Mooers construction provides relief of the guide section adjacent the connectors between the head and the skirt because these portions will become hotter than other parts of the

skirt. This extra temperature will cause extra expansion at those points, and as a result of the mechanical connection of the head and the skirt at those points distortion or mechanical expansion of the top of the skirt will also occur. The relief makes possible the distortion of the top of the skirt to compensate for the extra expansion at those points. This mode of operation is not disclosed in the Spillman & Mooers construction, nor is it inherent in the construction. It is disclosed in the Mooers construction and it is inherent in the construction as described. The result obtained in the two cases, I can't really give. The result so far as the successful operation of an aluminum alloy piston is concerned, I must consider as negative in both cases in so far as pistons as disclosed in the two patents are concerned. Neither of the constructions provide for the element of flexibility described in Gulick, Jardine, and Maynard, and apparently necessary for successful use of the aluminum alloy piston. The Spillman & Mooers construction, mode of operation, and results, I think, have very little in common with Schmiedeknecht.

Q. Will you compare this Exhibit EEE with the disclosure of the Spillman & Mooers patent and point out any differences you find between the two, if there are any?

The Master: That is the Spillman & Mooers and EEE?

Mr. Richey: Yes, sir, the half section is Spillman & Mooers.

A. I think Defendants' Exhibit EEE is a fair reproduction of the section shown in Fig. 3 of the Spillman & Mooers patent. The skirt sections in the exhibit are perhaps somewhat thinner than would be obtained by reproducing the Fig. 3 to scale, but nevertheless I would consider this a fair reproduction of the patent structure.

Q. Do you find at the top of the skirt in the patent a face which inclines inwardly and downwardly, which is not in Exhibit 3-E? A. Yes. No doubt put in by the machining operation.

Q. The purpose of that was to drive the oil into the interior of the piston, wasn't it? A. Yes.

Q. And in Exhibit EEE the bottom part of the skirt below the connector has been machined, hasn't it? A. Yes.

Q. That is not shown in the drawing of the patent, is it? A. Well, one could not say whether the finishing had been completed by machining or merely left as in the cast condition.

Q. Will you next compare the Defendants' Exhibit CCC in structure, mode of operation and results with pistons illustrated in each of the Gulick, Jardine, Maynard and Mooers patents in suit?

The Master: Is that the Chevrolet?

The Witness: Yes.

Mr. Bruninga: Chevrolet 4; the other one is Chevrolet 6.

A. Defendants' Exhibit CCC bears the same relation to the Gulick construction as was described for Defendants' Exhibit BBB, that is, the constructions are clearly different. The Gulick has the double-walled structure, web construction, bosses mounted in the web only and not attached directly to the skirt, whereas Defendants' Exhibit CCC is a single-walled construction, more along the lines in construction of the trunk type piston. In so far as mode of operation is concerned, however, Defendants' Exhibit CCC utilizes the flexibility attained by horizontal slotting between the head and the skirt, and vertical slotting on the skirt between the two bosses, and the vertical slot joining the horizontal slot. The mode of operation of Defendants' Exhibit CCC therefore is the same as the Gulick with respect to the flexibility gained by the co-operation of the horizontal and vertical slots properly placed. The flexibility is not gained in the degree that it is in Gulick, however. In so far as result is concerned, the Defendants' Exhibit CCC produces the same result as Gulick in so far as the successful result is achieved by the utilization of the co-operation of these slots to gain flexibility.

Q. Before you proceed, you have pointed out certain differences in structure. Will you point out what if any similarities there are in the structure between Exhibit CCC and the Gulick piston? A. The similarities lie essentially in the horizontal slot and the vertical slot co-operating to produce skirt flexibility in response to the cylinder wall pressures. One cannot say that the structure of Defendants' Exhibit CCC is similar to the structure of the Gulick patent.

Q. Now, will you proceed with the other patents in suit? A. The structure of Defendants' Exhibit CCC is

not specifically that shown in Jardine. It does, however, operate in a manner similar to that of Jardine, especially at the top portion of the skirt. There are the horizontal separation slots between the head and the skirt in Defendants' Exhibit CCC as well as in the Jardine construction. There is relief around the bosses in Defendants' Exhibit CCC the same as in the Jardine construction, considering for comparison purposes Figs. 6 and 7 of the Jardine patent. The skirt portion adjacent the bosses may be considered broadly the equivalent of the Jardine web construction in so far as mode of operation is concerned. The same analysis of the methods of compensating for the extra expansion at the top of the skirt in Exhibit CCC as applied to Jardine, with one of the bearing faces slotted only, can be made. That is, the compensation for extra expansion at the top of the skirt in Defendants' Exhibit CCC is made partly by flexibility of the skirt as the result of the co-operation of the horizontal and vertical slots, it is made partly by the distortion of the skirt as a result of the extra expansion across the bosses, and it is made partly by the mechanical distortion of the skirt as the result of cylinder wall pressure. These factors are aided by the rather extensive relief around the boss portions at the top of the skirt. In so far as mode of operation is concerned, therefore, Exhibit CCC functions approximately the same as Jardine when one bearing face only of Jardine is slotted with a vertical slot. In so far as the bottom of the skirt is concerned, Defendants' Exhibit CCC functions the same as Jardine from the standpoint of flexibility, provided only one of the Jardine bearing faces is cut through; but in so far as oil distribution is concerned, it doesn't function the same as the bottom of the Jardine skirt. In so far as result is concerned, I would expect a similar result to Jardine with somewhat better oil-pumping characteristics; that is, lower oil consumption.

What I have said with reference to Defendants' Exhibit CCC and Jardine, applies in so far as the top skirt section is concerned, to Maynard; and Defendants' Exhibit CCC is also similar to Maynard in construction at the bottom of the skirt. The detailed construction of Defendants' Exhibit CCC is somewhat different in the boss region as compared with the Maynard drawing, a portion of the skirt in Defendants' Exhibit CCC being generously relieved to be the equivalent of the Maynard web. In mode of operation, the mode of operation of

Defendants' Exhibit CCC with that equivalency in mind, is the same approximately as that of Maynard. Defendants' Exhibit CCC is perhaps an impairment of Maynard in so far as boss support is concerned, and probably also in so far as weight for a given strength is concerned.

Defendants' Exhibit CCC embodies the mode of operation and a construction which may be regarded as the Mocers construction or an equivalent of this construction. The head is joined to the skirt from the flange portion of the head at regions around the boss, as shown in Figs. 10 and 11 of the Mocers patent, and there is relief of the skirt or guide section in the region of such connectors as shown in the Mocers construction. The mode of operation of Defendants' Exhibit CCC in so far as the function of the horizontal slots and the connectors are concerned, is the same as that of Mocers. This is made possible by the co-operation of the connectors and the horizontal slot and the relief to compensate in a measure, at least, for the extra expansion of the skirt at the top. In so far as results is concerned, no doubt Defendants' Exhibit CCC would produce substantially the same result as Mocers in so far as the distortion feature is involved in compensating for extra clearance. Of course the piston, when it is completed, that is, Defendants' Exhibit CCC, would function much better than Mocers because of the addition of the flexing feature to compensate for extra expansion.

Q. When you and your associates were trying to make the Ricardo piston operate successfully, as you have testified, did you or any of your associates in that work as far as you know, know of the Gulick patent or the Gulick piston? A. I knew nothing about it and I never heard any of them mention it.

Q. Do you know of any metal of which internal combustion engine pistons are made or have been made which, employed in the construction of the piston illustrated in the drawings of the Gulick patent, would have webs that weren't flexible? A. No.

Q. State whether or not it would be possible in your opinion to make a piston out of any metal employed for making internal combustion engine pistons and conforming to the drawings of the Gulick patent, without having flexible webs? A. No, it would not be.

Q. Will you now take up the Franquist patent 1,153,902, about which you were asked in your cross examination, and compare the piston illustrated and de-

scribed therein in structure, mode of operation, and results, with the pistons illustrated and described in each of the patents in suit? A. In so far as the structure of the Franquist piston is concerned, it is quite different from that of Gulick. It is a single-walled structure as contrasted with the double-walled structure of Gulick. And its distinctive essential from an ordinary piston is the skirt construction, more particularly the ribs designated 12, which are supposed subsequently to be grooved to produce grooves 13. Aside from these ribs and grooves and a somewhat unconventional construction of the head section proper, this piston is similar to a trunk type piston. The mode of operation of the Franquist piston is also different from that of the Gulick piston. Taking the drawing, Fig. 1, for reference, it seems clear that if this construction were made of aluminum alloy and mounted as shown, it would function only approximately the same as a trunk type aluminum alloy piston. There are two horizontal slots in the Franquist construction at the top of the skirt and in the bottom ring groove. These are on the thrust faces and join the upper ends of the vertical grooves. The sections around the bosses are relieved, according to the specification, from the top of this piston skirt to a point below the bosses. This relief amounts to .005" on a side. The construction contemplates circumferential contraction and expansion of the skirt by virtue of the closing of slots 13 in response to cylinder wall pressure, and the re-opening of such slots as a result of the elasticity or resiliency of the metal of which the piston is made. If the construction shown in Fig. 1 and mounted as in Fig. 1, is made of cast iron, the piston should function much as a trunk type cast iron piston would, with the relief hampered in its functioning because of the locking of the wrist pin on both ends. It is probable, however, that this construction in cast iron would function approximately the same as a cast iron trunk piston. On the other hand, if this piston were made of aluminum alloy, the piston would not function satisfactorily and would surely seize if mounted according to instructions given in the Franquist specification. This would result from the binding effect of the wrist pin, which is made of steel, and hence which will not expand as much as aluminum during the process of heating up of the motor. In fact the tendency would be for the wrist pin and its locks to pull the sides of the piston adjacent the slot farther away from the cylinder

walls and thereby expand the thrust faces. This of course would militate against successful functioning of the piston. But even if the wrist pin were mounted free at one end, or both ends, the piston could not be mounted in a cylinder as described in the specification and function properly. The grooves 13 are supposed to be sufficiently flexible to permit of circumferential contraction as the piston expands against the cylinder wall. These ribs are not sufficiently flexible to permit of the operation as contemplated and described in the specification. There is not sufficient circumferential flexibility to be utilized to compensate for the expansion.

As to mode of operation, if the Franquist piston should operate as described, the principle of compensation would be different from that of Gulick. The Gulick flexibility is gained by flexible webs and flexible skirt and co-operation between horizontal and vertical slots permitting the flexing of the skirt. This may be referred to as the cantilever principle. The Franquist principle may be referred to as the accordion principle. Therefore the mode of operation of the Gulick construction is different from that of the Franquist construction. In so far as result is concerned, the Gulick construction is capable of compensating for the extra expansion of aluminum alloy, and the Franquist construction, as given, is not so capable, according to my belief.

Q. Will you now take up the Franquist patent with the next patent in suit, if you have finished with the Gulick? A. The Franquist construction is not like the Jardine construction and is not designed to function like the Jardine construction. The vertical ribs and grooves in the Franquist construction are not the equivalent of the vertical slots of the Jardine construction. In so far as mode of operation is concerned, there is a similarity, assuming something which is not shown in the Franquist assembly, that is, assuming that the wrist pin is mounted freely, the Franquist construction at the top of the skirt will operate in so far as mechanical distortion, somewhat similar to Jardine. The allowance, however, in the Franquist is not sufficient to take care of the expansion at the top of the skirt when aluminum alloy is used. He calls in his specification for close fitting of the piston when the motor is cold, with the exception that there is .005 relief over the bosses extending to the top of the skirt and to a point somewhat below the bosses on the sections 14 in the Franquist drawing. Assuming that

those sections 14 occupied approximately half of the circumference, that would be equivalent to about .005 clearance at the top of the skirt. That clearance could only be made available after cylinder wall pressure had expanded the two bosses to a certain extent; so that from that standpoint the Franquist construction apparently would only function up to a total compensation for clearance of .005" on the average diameter of the piston, assuming a tight or snug fit when the motor is cold. That would not be sufficient in aluminum alloy, whereas the Jardine construction shows adequate compensation in that regard. But the piston would have no clearance at the bottom of the skirt, that is, the Franquist piston; therefore all of the expansion must be taken care of by the circumferential flexing, by the flexing of the ribs or grooves in the Franquist piston. To my mind that would not be possible with this construction, and hence the Franquist construction would fail to operate properly in a motor at all. So far as the result is concerned, Jardine obtains a result and Franquist does not.

What has been said with reference to Jardine applies also to Maynard, that is, the construction of the Maynard piston is different from that of Franquist; its mode of operation is different; and its result is different.

With respect to Mocers, the Franquist construction is supposed to be a flexible one in so far as the skirt is concerned, whereas Mocers is not. The construction of the skirt sections in Mocers and Franquist are therefore different. Franquist utilizes horizontal slotting, as does Mocers, but the effectiveness of the horizontal slotting in the Mocers construction is made possible by proper relief and also by allowing the horizontal slot to act as an insulator of heat, so that the skirt will not become as hot in portions separated from the head by the air gap, as it will in other portions. In the Franquist construction there is a ring put right over the horizontal slot. This ring is pushed tightly against the head portion during the down stroke and tightly against the skirt portion during the upstroke of the piston, and the ring of course gets hot and it has an opportunity therefore to impart its heat to the top of the piston skirt, which is not true of the construction shown in Mocers. Even so, the air gap in Franquist would operate to partly reduce the amount of heat that would pass from the head to the skirt in the region of the slot; how much I don't know, whether it would be 50 per cent or 75 per cent, but at

any rate the ring is capable of imparting a considerable amount of heat to the top of the skirt. So that at any rate the slots in Franquist would not be as effective in producing the thermal distortion as in Moocrs. To that extent, whereas the Franquist construction might operate to a degree like the Moocrs, it does not gain the full advantage of the horizontal slotting in so far as that particular feature is concerned. Apparently the horizontal slot is not designed to serve as a heat insulator in the Franquist piston. It was designed to help with the flexing of the skirt portion. Had it been designed to act as a heat insulator, the ring would not have been put over it. Again, in so far as result is concerned, we may say that neither of these pistons achieved the final success, either the Franquist or the Moocrs; but the Moocrs principle of compensation for extra expansion is now utilized in a good many constructions substantially as described by Moocrs, whereas the Franquist piston principle, so far as I know, is not used at all in the pistons at the present time. I guess there is no particular relationship between Schmiedeknecht and Franquist so far as I can see.

Q. You were asked during cross examination regarding taper grinding. Can you state whether or not the taper grinding of pistons in your opinion contributed to the success of the aluminum piston? A. The taper grinding was used even on the old trunk type aluminum pistons, that is, the clearance at the top of the skirt was made greater than the clearance at the bottom of the skirt. While this was helpful in the trunk type pistons, it was not sufficiently helpful to solve the problem.

Q. Now, will you state whether or not the pistons made in accordance with the patents in suit have been used without taper grinding? A. Yes, they have.

Q. To what extent? A. Very substantial.

Q. And with what success? A. With very great success.

Q. Now, during your cross examination you were asked about what my brother spoke of as the keystone shape of the relief at the bosses. Will you state whether or not that has contributed any to the success of these aluminum pistons? A. It has contributed in a minor degree to the success of the aluminum pistons in more recent years. It was not a controlling factor, however, in the solution of the difficulties, and it is not a necessary feature for the success of the aluminum alloy piston.

Q. You said that the engineers of the Aluminum Castings Company, including yourself and certain British engineers, were struggling to solve the problems solved by the patents in suit. Do you know whether anyone else was struggling with this problem during the time prior to the final solution of it by the patents in suit? A. Yes.

Q. Will you name in a general way such as you know, were known to you to be working on this problem during that time? A. This problem of taking care of the excess expansion of aluminum pistons was acute even in 1916 at the time I was working actively with the Aluminum Castings Company. Beginning in 1916 I personally had meetings and conferences with a good many automotive engineers in the United States who were working toward a solution of this problem. The problem was recognized throughout the automotive industry. I recall meetings that I had with Col. Vincent, chief automotive engineer of Packard Motor Car Company, D. McCall White, chief automotive engineer of Cadillac, Mr. Ferguson, chief automotive engineer of Pierce-Arrow, and several others, during the period 1916 to 1919. From my own knowledge I can say that the automotive industry was alive to this problem and that the clearance problem was the one which needed solution most in order to make practical the utilization of aluminum alloy pistons in pleasure cars.

Q. Who was this Mr. Ferguson to whom you referred? A. He was chief engineer of the Pierce-Arrow Motor Car Company.

Q. Now, you were asked during your cross examination whether or not you knew the piston of the Franquist patent had been used commercially. Do you know whether or not any of the licensees of the Cleveland Trust Company have ever manufactured a piston like that shown in the Franquist patent? A. Not that I know of.

Q. Has anyone to your knowledge manufactured it since the Franquist patent expired? A. Not that I know of.

Q. You have stated that in your opinion the piston of the Franquist patent and that of the patents in suit operate differently. Is this opinion based upon any tests or observations you have made of the pistons themselves? A. Yes, it is.

Q. Will you state briefly what those observations were and what the tests were? A. By applying pressure on two opposite sides of the skirt of the piston—

Q. You can use this Exhibit 3-Q in answering the question, if you wish. A. —by applying pressure on opposite sides of the skirt of the piston, one can of course cause its diameter to decrease. If this is done with the Gulick piston, Plaintiffs' Exhibit 20, it will be found that the increase in diameter in a direction right angles to that at which the pressure was applied is negligible. For example, the Gulick piston can be compressed across the bosses by mechanically applied force, so that its diameter in that direction is reduced .010". It will be found that the diameter at right angles has not changed appreciably. This means that the clearance will have been greater by approximately .005" under such circumstances. I have run such tests on the Gulick piston. I have also run tests on a piston similar to that of the drawings of the Franquist patent referred to earlier, and find that when the diameter of the piston at the bottom of the skirt is compressed .010" in one direction, there is an expansion in a direction at right angles to the direction of applied stress equivalent to some 75 or 80% of the contraction at the point stressed. I have run similar tests on pistons which did not have the vertical slot completed, for example of the type of Plaintiffs' Exhibit 1 prior to the completion of the slot, and found that it behaves quite similarly to the Franquist, except that the stress required to produce a given amount of deformation was less in the Plaintiffs' Exhibit 1 type of piston. The expansion in the direction opposite to that of the applied stress was comparable in magnitude to that in the Franquist type piston. After the completion of the slots in the Plaintiffs' Exhibit 1 type of piston the behavior is more like that of the Gulick construction and less like that of the Franquist construction. The Franquist skirt therefore behaves very much like the skirt of the trunk type piston and not like the skirt of the Gulick type piston.

(Adjournment taken to 1:30 P. M.)

(1:30 P. M., the hearing was resumed, Mr. McCoy also being present.)

Q. Doctor, will you take the can opener, Exhibit 3-I, and demonstrate the piston 3-Q which the defendant produced as a Franquist piston, and Plaintiffs' Exhibit 1, with this can opener, showing the Court that the one is flexible, and what is the condition of the other one? A. I have in one hand the testing device, Defendants' Exhibit 3-I, and in the other hand I have piston, Plaintiffs' Exhibit 1. I apply very mild pressure on the handles of

the testing device, and the closing of the vertical slot can be readily seen. That is at the bottom of the skirt of the piston. At the top of the skirt I also apply mild pressure, and the opening and closing of the slot can be readily seen with the unaided eye. I now have in my left hand the Franquist piston, Defendant's Exhibit 3-Q. Applying the testing device to the bottom of the skirt, I apply mild pressure and no closing of the slots can be seen with the unaided eye. I apply pressure to the full extent of my grip, and perhaps there is a little suggestion of a motion, but it is doubtful, and there is not very much closing of the slot, and clearly insufficient to accommodate the excess of expansion when the piston is operated in a motor car. Applying the same test to the top of the skirt with mild pressure such as used in Plaintiffs' Exhibit 1, no motion can be seen, and with pressure to the full extent of my grip, the structure behaves substantially as a rigid body.

Q. How did the pressures that you applied compare with those encountered in piston use? A. Plaintiffs' Exhibit 1 is a commercial piston, and the flexibility in the skirt of Plaintiffs' Exhibit 1 is known to be proper for compensation for excess expansion of the aluminum alloy. If the flexibility of Plaintiffs' Exhibit 1 is proper for motor car operation, then it would appear that the flexibility of the Franquist type piston must be on the order of, say, not more than about a tenth of that of Plaintiffs' Exhibit 1. That is a difference of an order of magnitude insofar as flexibility is concerned.

Mr. Richey: That is the end of the direct examination.

Re-Cross Examination by Mr. Bruninga.

Q. Doctor, you said in answer to one of Mr. Richey's questions that the Kant-Skore case in Cincinnati was tried, I think you said that, didn't you? A. Yes.

Q. You were there during the trial of the case? A. Yes.

Q. It was not tried to conclusion, was it? A. There was no decision rendered by the Court.

Q. There was a settlement, wasn't there? A. Yes.

Q. Do you know the terms of that settlement? A. Generally, yes.

Q. What were the terms of the settlement? A. I think the Kant-Skore Company agreed to the validity of the patents in suit and that they had been infringed,

and they also took a license under those patents which were in suit.

Q. Those molding patents—those Banberg patents, Norton and Parkhurst patents? A. Yes.

Q. And a lot of other patents? A. Yes.

Q. In fact all of the molding patents the Aluminum Company of America had? A. All of the molding patents, I think, relating to pistons.

Q. Did the Kant-Skore Company come to you or did the Aluminum Company go to them in the matter of taking license under the patents, or was that made a part of the settlement? A. I don't know.

Q. One cent royalty was paid per piston, isn't that right? A. That was the agreement of the license, as I recall.

Q. What were pistons selling for in those days, 1923? A. It differed for different size and weight pistons, of course, but as I recall it, average price of a piston at that time would be somewhere around 65¢.

Q. The margin of profit was much greater than the one cent, wasn't it?

Mr. Richey: I object to this as immaterial. What difference does it make to the issues of this case what the margin of profit was?

Mr. Bruninga: What difference does it make if the Kant-Score case was tried?

Mr. Richey: That is the reason why I think you were wrong in going into it in the first place.

Mr. Bruninga: You know this witness was asked in cross examination whether the case was tried or he knew about it?

Mr. Richey: Yes, but that refers to what was asked by you on cross examination.

The Master: He may answer.

A. I don't know what the margin of profit was.

Q. But it was more than one cent per piston? A. I assume it must have been.

Q. It was at least ten cents a piston in those days? A. I don't know.

Q. Do you consider that a good fat royalty, one cent a piston?

Mr. Richey: I object to that as immaterial.

The Master: He may answer; same ruling.

A. I don't know what you mean by "good patent royalty." I think it is a royalty in line with a good many royalties that are paid on patents throughout the country.

Q. You also testified on re-direct examination that the split piston patents made possible the commercialization of the piston by the permanent molding process; did I understand you correctly? A. Yes.

Q. Isn't it a fact that both before Judge Faris and Judge Kerrigan you took the position that the molding process made possible the utilization of the split skirt? A. Yes, those two things go together in the piston art. That is the fine qualities of metal attained by the permanent molding process, in the selection of alloys and so forth, which really make possible the use of aluminum in considerable quantities as a piston material. Now, the slotting of the skirt is essential for the development of the aluminum piston business for pleasure car purposes, and that in turn is dependent on the qualities of metal attained in the permanent mold product.

Q. You said that in 1916, just one year after the permanent molding process came into use in this country, as I believe you testified before both Judge Faris and Judge Kerrigan, the situation was acute on account of no compensation for expansion at that time? A. That is correct.

Q. You did not tell either Judge Faris or Judge Kerrigan that, did you?

Mr. Richey: I object because it is immaterial. That wasn't in issue in this case.

The Master: He may answer.

A. I don't recall that I did. Had I been asked I would have. I am saying now, however, that it was not as acute then as it might be today, because the matter of noise was not given the weight in 1916 that it is in 1933, nor perhaps is the matter of oil pumping.

Q. I believe you stated on re-direct examination that the clearance problem needed solution in order to make the aluminum alloy piston successful in pleasure cars, and you had reference to as early as 1916, '17, '18 and '19, didn't you? A. In order to make it more practical. Didn't I say "practical"?

Q. Well, I would take that as a modification. A. There was so much trouble with the clearance problem that concerns like the Packard Motor Car Company would use aluminum alloy pistons for a time, gaining the advantages of high heat conductivity and lightness, only to turn back to iron a little later to get rid of the slapping

or noise of it. And then they would turn back again a little later to aluminum in order to get back the advantages of lightness and high heat conductivity. That is the type of difficulty that the aluminum alloy piston had in the earlier days.

Q. Did you tell Judge Faris or Judge Kerrigan that when the molding patents were in suit? A. I don't know that I did. I think it was mentioned, however, in the suit that there were these switches back and forth from aluminum to iron and iron to aluminum. I don't think I was asked about anything like that, I don't know.

Q. There were statements all about it as prior efforts and failures by both you and Mr. Richey. A. No, these things happened after the molding patents were taken out—after the process development was made.

Q. But you told both Judge Faris and Judge Kerrigan that the pistons were found very successful in trucks, in airplanes and by the Reo Motor Company without splitting of any skirt? A. That is correct.

Mr. Richey: Is your previous answer correct as it relates to the molding patents?

(Previous question and answer read by reporter.)

The Witness: Yes, the main molding patents, I think issued in 1919. What I meant was these things happened after the molding process had been developed and after the permanent molded piston had been put on the market.

Q. That was in 1915? A. Yes.

Q. Now, you said the flexibility of the piston was solved in 1920. By that you mean Jardine and Maynard? A. Well, the first real solution that I have knowledge of was Jardine.

Q. And the next one Maynard? A. Yes.

Q. Now, you said on re-direct examination that you heard of various means and ways to take care of expansion. What were they? A. I don't exactly recall that part of the testimony, but one means was taper grinding; another means was the horizontal slotting.

Q. Like in the Meagrs patent? A. Well, that was something on that order, yes. I don't know whether this testimony that you refer to has to do with the Ricardo tests or whether it has to do generally.

Q. No, it didn't. You just made the statement that you heard of various ways to take care of expansion and

then you said a number of these were tried out and a number dismissed? A. Yes. Well, another was the composite type of piston, that is, with an aluminum head and a cast iron skirt.

Q. And that was a failure? A. Well, that was a failure from the practical standpoint, yes.

Q. It was used in the Marmon car, wasn't it, for a while? A. It was.

Q. In what year? A. Oh, I think it was used as late as 1921, possibly as late as 1922; but the piston was expensive and heavy and it was also difficult to hold the two parts together in operation.

Q. It is still used in some of the Nash cars today, isn't it? A. I don't know of any that use it, but that was one of the means employed, at any rate, to solve this expansion difficulty. Then another means was the slotting of the top of the skirt, and I distinctly recall the Franklin Motor Car Company using that as one means of overcoming the difficulty.

Q. You mean the top? A. Oh, I mean slotting the bottom of the skirt.

Q. In other words the running of a single slot from the bottom of the skirt to near the ring lands between the wrist pin bosses, in that region between the wrist pin bosses? A. The particular slots I have in mind ran about half way around the skirt, and four slots were used from the bottom of the skirt extending, say, about half-way up the skirt.

(Short recess taken.)

Q. Is Defendants' deposition Exhibit B one of these Franklin pistons that you have referred to? A. Yes.

Q. Do you remember what year that was that this piston was used in the Franklin car? A. I would have to say from my recollection, but as I recall it it was the summer of 1916.

Q. Do you know how long that was used in the Franklin car? A. No, I don't know. I know they continued to put these slots in.

Q. Is that one of those that you tried out and dismissed? A. Yes, this is one of the types I had in mind as having been tried out and having failed to solve the problem.

Q. The bottom of that skirt is, however, very flexible? A. Yes.

Q. Now, can you enumerate another one of those pistons that you have heard about or tried out or dismissed,

and by you, I mean your company, which I believe was the Aluminum Manufactures? A. It was Aluminum Castings Company between 1915 and 1919, and Aluminum Manufactures, Incorporation, after about 1919. Another one was a piston of the two-walled type, known as the integral aluminum piston, however, as distinguished from a composite type of piston. It was sought to effect a reduction in clearance by keeping the skirt cool. This also failed to function properly.

Q. And what was the construction of that piston? A. It was a double-walled aluminum piston with the bosses held on the inside wall and not directly attached to the skirt. The piston was cast in a permanent mold with a flange at the bottom of the skirt. The boss-containing portion was reduced in diameter so that it was considerably smaller than the outside diameter of the piston. The flange was then spun to produce the skirt proper, and the effect was one of having the head and skirt separated by a complete horizontal slot.

Q. And whose piston was that? A. It was the Aluminum Castings Company's own piston.

Q. Was Elmer Long's piston included in any of those you heard about and tried out and dismissed? A. Not to my personal knowledge.

Q. You never heard about the Long piston at all in those days before Mr. Jardine conceived his piston? A. As I recall it, not before Mr. Jardine's piston was developed.

Q. But you did hear about the Long piston? A. Later, yes.

Q. Do you remember what year that was? A. No, I couldn't say.

Q. What car did you see it in? A. Why, I didn't see it in any car. I saw some pistons around the plant of the Aluminum Manufactures, Incorporated, in Cleveland, for the Franklin car, as I recall it.

Q. And that was about the year 1919 or '20? A. I can't say from my recollection.

Q. But your company never gave that a trial in the laboratory or otherwise? A. Well, I don't know about that.

Q. Do you remember the construction you saw at that time? A. No, I wouldn't be able to identify it.

Q. Of the pistons about which you heard or tried out or dismissed, was there any piston of Albert Spillman of North Tonawanda, New York? A. Not that I recall.

Q. Well, you saw that piston later on at the Kant-Skore trial, didn't you? A. Yes.

Q. And that is the first time you saw it? A. No, I had seen it a little time before that, but as I recall it only a few months before the Kant-Skore trial.

Q. You didn't try that out at all? A. Not that I recall.

Q. Well, you were interested in finding out what was being put on the market, weren't you? A. Yes.

Q. Didn't you go to Europe about 1919 and 1920? A. I went to Europe in 1919.

Q. In part investigating the piston situation? A. I did when I was in Europe, yes.

Q. You say that was 1919? A. Yes, that was 1919.

Q. And you investigated the Ricardo piston at that time? A. I did.

Q. And did you investigate the Rolls-Royce piston at that time? A. No, not directly. That is, I didn't see the Rolls engineers, but I did see, I think, some of the pistons being manufactured in the rough.

Q. Can you tell me what type pistons these were?

Mr. Richey: I object to this as immaterial. Any use abroad would be immaterial so far as American patents are concerned.

Mr. Bruninga: Oh, no, this witness has said—

The Master: He was familiar with the art.

Mr. Richey: Well, the art don't include prior uses abroad. That is not a statutory defense to a United States patent. It has got to be in this country.

Mr. Bruninga: That proposition comes up every once in a while, your Honor, and if this witness went over to Europe and he saw a piston in use over there and communicated it over here—

The Master: I think he may answer that question.

Mr. Richey: Your Honor, I would like also to object to it on the ground he is going into prior art on our prima facie case and makes the witness his own, and that objection should apply to all the questions regarding the prior art.

Mr. Bruninga: Regarding that statement that I make the witness my own, I have never heard of such a proposition, except from this counsel in a number of cases.

Mr. Richey: It is a rule in Federal Court—

The Master: The same ruling. You may proceed.

A. All I saw of the Rolls-Royce, as I remember it, was just a rough casting, and this was an ordinary trunk type piston casting, as near as I can recall it.

Q. You didn't see Mr. Ernest Hyde, one of the engineers of the Rolls-Royce, then, did you? A. No.

Q. Now, those pistons that you heard of or that you tried out or that you dismissed, did they include the Stephen D. Hartog piston? A. I don't know. I don't recall that piston.

Q. You don't recall it, then, by name? A. No.

Q. Do you recall the piston shown in the United States patent 1,842,022?

Mr. Richey: Same objection.

The Master: Same ruling.

A. I recall the drawing, is all. I don't recall having seen a piston like that.

Q. That isn't, then, one of the pistons that was tried out? A. I have no knowledge that it was tried out, or that it wasn't.

Q. Now, you say you never heard of the Gulick piston until when? A. Until I was asked to give testimony in a deposition in an interference case on behalf of Gulick.

Q. Around 1926 or 1927? A. I don't recall that date.

Q. Was that testimony given in behalf of Gulick or Cleveland Trust Company? A. Well, on behalf of the Gulick application for the Cleveland Trust Company.

Q. Now, you have said on re-direct that the war minimized the activity in aluminum pistons. It was really not until 1919 that this company really proceeded with the attempted solution of this problem? A. No, they were working practically on it from the first that I can remember in the Aluminum Castings Company.

Mr. Richey: I don't believe he said that. He said minimized the activities between the nations. I don't think he said what you said there.

Mr. Brannings: Well, the record will show what he said. That is what I understood him; if I am wrong it can be corrected.

Q. However, what do you say, did it minimize the activities everywhere or the activities of your company?

A. I think what I said was it minimized the international exchange of information, so that there was quite a period when we knew very little about what was going on abroad; but the activities of the Aluminum Castings Company were continuous on this problem, from my knowledge, since late 1915 or early 1916.

Q. It was not until 1920 that anything was produced of sufficient importance to enable its use successfully in a motor car, pleasure car? A. It was about that time, according to my personal recollection that the Jardine solution was made, and that as I said before, was because it has proven worthy with reference to this particular phase of the aluminum piston problem.

Q. You are referring now to the efforts made by your company and not perhaps others? A. No, I had in mind the efforts made by others as well. If a real solution of this problem had been found abroad, or outside of the Aluminum Castings Company, the chances are very great that we would have known about it in connection with our work and our activities. That is, what I may call a practical solution of the problem.

Q. Well, you know, don't you, or had reason to believe, that the Long piston was in use in the Franklin cars in 1919? A. Well, I don't happen to recollect that, but if it is a fact I would still say the same as I just did: that is, the Long piston was really no solution of this problem.

Q. And you are familiar with the Long piston? A. I am familiar with one type of what is known as the Long piston, yes.

Q. And that is the type that is in evidence here that is marked for identification as Defendants' Exhibit FFF? A. Yes.

Mr. Richey: We make the same objections.
The Master: Same ruling.

Q. And you personally consider that that is not a solution of the problem? A. That is correct.

Q. Why? A. Well, in the first place the piston is in part double-walled; it is relatively heavy; it is expensive to cast and it requires a greater clearance on the thrust faces than the pistons now, the single-walled pistons that have solved this difficulty.

Q. Well, you know, don't you, that suit was filed against Mr. Long's company in Detroit on account of infringement of some of the patents in suit?

Mr. Richey: I object to that. The record is the best evidence of that.

The Master: He may answer.

A. No, I have no knowledge on that.

Q. Your main objection really it is a double-walled construction? A. Well, I don't think it is a practical solution of the problem, no.

Q. Have you ever met Mr. Long? A. No, not that I recall, at least.

Q. Now, with reference to the Ricardo piston about which you have testified on cross examination and on re-direct, have you any samples of that piston? A. Not here. I think I could find a sample.

Q. You mean a sample of just one Ricardo construction, I mean as to details? A. I don't know what samples might be available. There may be more than one.

Q. Well, you tried out various constructions, didn't you? A. Tried out pistons for different motors.

Q. Were they all constructed the same as to details? I don't mean as to thicknesses but as to arrangement of webs? A. No, I think not. I think there is a horizontal web in the drawing of the Ricardo patent that was left out, yes, C-3, in Ricardo United States patent 1,294,833, that was left out, at least on one of the constructions as I recall it.

Q. Well, the webs C weren't made as heavy as shown in the patent in all of the constructions, were they, I mean relatively? A. In the pistons made up under the direction of Mr. Parnell and Mr. Pomeroy and Mr. Halford, I think the sections were quite comparable to those shown in the Ricardo patent. There were some pistons made up later with thinner webs and also the Jardine construction was made, which has considerably thinner webs than those shown in the Ricardo patent. The web and head construction, however, was different in the Jardine pistons which were made in the permanent molds.

Q. A structure without the web C which you have referred to, is that illustrated in Fig. 2 of "The Automobile Engineer" of October, 1918, isn't that right?

Mr. Richey: I make the same objection. Is that alleged in the answer?

Mr. Bruninga: No, it is not set up in the answer. I am trying to find out what this company

did with the Ricardo pistons, about which he has testified so at length.

Mr. Richey: I object further on the ground that the publication is not set up in the answer.

The Master: Same ruling.

A. Yes, that is the type of construction to which I had reference.

Q. How about the construction shown in Fig. 4? Did you try that out also, Fig. 4 on the same page, page 274? A. (After examining same) No, I don't recall that that was tried out. That is for a very large bore piston, seven inches in diameter. We didn't test out anything as large as that.

Q. You didn't test out anything in which the webs weren't parallel but at an angle, as shown in Fig. 4? A. Oh, I think we very likely tested structures where the webs were at an angle, but I didn't recall testing anything just as that construction. If it is the angularity of the webs you have in mind, I think perhaps we did test pistons with angular webs.

Mr. Brueninga: The magazine shown to the witness is marked for identification as Defendants' Exhibit 3-S.

Q. You say none of those pistons ever went into use? A. In the United States?

Q. Yes. A. Well, so far as I know they didn't.

Q. Did they go into use in Europe at all? A. That is my understanding, that they did to a small extent.

Q. They are still used today in Europe, are they not? A. Not according to my information.

Q. But they actually did go into commercial use, then, whether here or in Europe? A. It was so reported, but I don't know of my own knowledge.

Q. Well, you met Mr. Harry F. Ricardo, didn't you? A. No.

Q. Well, you know he is an eminent engineer, don't you? A. Yes.

Q. You won't dispute his statement if he said it did go into wide use? A. I don't know.

Mr. Richey: I object to that as immaterial, ask for hearsay, and further object to these questions regarding this piston as immaterial.

The Master: He has already answered.

A. (Continued) I may say in that regard trunk type pistons went into use also. I have also testified

that this Ricardo type piston behaved in a motor a good deal like a trunk type piston. So that the fact that it may be used, is, I think, one which I would not dispute, at any rate it is a question as to how successfully it can be used.

Q. The double-walled type that you referred to just a little while ago as having been made by your company or brought out by your company, was that split in any way? A. No, not in a vertical direction. The head, however, was separated from the skirt proper around the entire periphery of the piston.

Q. Where did that piston get too hot, at the top or at the bottom? A. Which one?

Q. The piston that you have just talked about, the double-walled type? A. Well, it got too hot particularly at the top of the skirt, but I presume that that whole piston was too hot for proper operation in the cast iron cylinder barrel.

Q. Now, you referred to Mr. Lawrence Pomeroy as one of the engineers that was sent over here. He was sent over here, or rather, he actually did something else but stand around; he worked on this thing, the Ricardo piston here, didn't he? A. Yes, his advice was given to the Ricardo representative and also to the Aluminum Manufactures, Incorporated, or the Aluminum Castings Company.

Q. He contributed something to the Ricardo piston, didn't he? A. Well, I don't know that he contributed anything; he worked on it. He tried out these Ricardo pistons in a motor that he was developing, and discarded them, and then he had a scheme of his own for compensating for the excessive expansion, as I remember it.

Q. What was his scheme? A. He sought to make the webs flexible in the direction of the thrust, by a series of slots in the webs themselves.

Q. Like that shown in Pomeroy patent 1,459,073? A. Yes.

Q. Was that tried out? A. Yes, that was tried.

Q. And that was also a failure? A. It was. Yes, it was not a satisfactory solution of the problem, at any rate.

Q. Didn't that take care of the expansion to some extent? A. Yes, but it produced, as I recall it, a permanent set too easily in the flexed portion.

Q. Were those pistons that you tried out, Ricardo and Pomeroy pistons, made in permanent molds? A.

Some were made in permanent molds and some were made in sand.

Q. The sand casting was no good whatsoever, was it? A. Well, it didn't have the wearing qualities that we desired, but it was sufficient to test the expansion characteristics. The expansion of the sand casting is the same as that of a permanent mold casting when the two are heated to the same temperature, but you wouldn't expect even a half decent device in the sand mold.

Q. Because of your theory of the utility of casting in permanent molds? A. Well, I wouldn't expect a salable device, I wouldn't have at that time, at any rate.

Q. And a construction like that shown in the Ricardo patent, 1,294,833, and as shown in the Pomeroy patent 1,499,073, was actually cast in permanent molds, then? A. Yes, those were cast in permanent molds, that is, pistons of such construction.

Q. Didn't the overhanging slipper edges prevent you from withdrawing the outside mold part? A. Yes, in that particular construction that is true. And also there was a problem at the head section, but that was taken care of by a couple of separate inserts which were taken out after the piston was removed.

Q. But both of those were actually cast in permanent molds? A. Yes.

Q. Even when they had the overhang? A. Well, the overhangs were eliminated in the permanent mold castings, but the direct connection of the head and webs was made possible by the use of inserts in the mold, as previously mentioned.

Q. Who suggested the elimination of the overhangs? A. I have no idea.

Q. Do you know whether any of the British engineers suggested it? A. I haven't any knowledge on that subject at all.

Q. Now, you said a number of expedients were tried out to make the Ricardo piston satisfactory. What expedients were they? A. Well, I can't say from my own recollection now as to just all the things that were tried, but I do recall very clearly that the men whose names I have previously mentioned were trying in every way that they could to make this piston successful, and that I know involved the changes in actual clearance, that is, various means of fitting pistons, and I also know that the pistons when they came out of the motors, especially when the fitting was close or close enough to avoid noise,

had scoring on the bearing faces opposite the ends of the webs, and change of clearance in these portions, as I recall it, was tried to get away from that difficulty; but nothing that could be suggested by the British engineers or our own engineers was sufficient, or offered sufficient improvement to warrant the approval of the Ricardo piston.

Q. You mentioned Mr. Pomeroy as having suggested an expedient. What other than as shown in his patent did he suggest? A. Well, Mr. Pomeroy's attempted solution of this problem with the Ricardo piston, as I recall it, came quite a bit later. That is, I think that the piston was put into discard, so to speak, before this suggestion of Mr. Pomeroy's, although I can't say positively as to that.

Q. Did Mr. Pomeroy suggest any other than that? A. Well, not specifically as I recall it.

Q. Do you know of any expedient that Mr. Parnell suggested? A. Not specific, no. I can't name the suggestions that any particular individual offered in this case.

Q. And that is true of Messrs. Blank, Wesley, Carpenter and Allyne? A. Yes.

Q. How about yourself; you know what you suggested? A. Yes, I know that I had nothing to suggest after hearing what the others had tried.

(Short recess taken.)

Q. I understood you to say, Dr. Jeffries, that these Ricardo pistons scored opposite the webs, is that right? A. Yes.

Q. That is about on a line with the webs? A. That is correct.

Q. Is that one of the purposes of Pomeroy's arrangement, to prevent that scoring? A. Well, it was that and also to stop slapping. In other words, to try to make a Ricardo piston function in the motor so that it wouldn't stick or it wouldn't slap.

Q. Do you know who owns the Ricardo patent now? A. Why, I don't know, but I suppose it belongs to the Cleveland Trust Company, in this trust.

Q. How about the Pomeroy patent?

Mr. Richey: We state that the Cleveland Trust Company doesn't own the Ricardo patent.

Mr. Braninga: The Pomeroy patent is owned by the Cleveland Trust Company?

Mr. McCoy: Yes, now. The Pomeroy patent 1,490,073.

Mr. Bruninga: Is that also true of the Hartog 1,842,022, previously referred to?

Mr. McCoy: Yes, that is owned by the Cleveland Trust Company.

Q. Can you explain why that scoring took place in the Ricardo patent and does not take place in the Jardine patent opposite the web; that is, I understand the surfaces of the slippers directly in line with the webs were the ones which were scored? A. Yes, in general, or briefly, the Ricardo construction is a strong, rigid, non-flexible box-type structure, and when the webs heat up from the combustion of gases in the motor, they expand, and there is no place for the metal to go readily, except to materially increase the length of those webs, so as the length increases pressure against the cylinder barrel increases, eventually scoring results. Whereas in Jardine you have the structure made so that it will be flexible and you have slots so as to permit flexing.

Q. In other words in the Ricardo construction where there is no slot here, the outward pressure due to the expansion of the web, will cause the surface of the slipper to move right against the slipper and cause scoring; is that right? A. Yes.

Q. And that is not true in the Jardine patent structure because these webs can flex down? A. That is correct; that is, it is not so of the Jardine construction.

Q. That is the reason there is no scoring in Jardine and there is scoring in the Ricardo, because these webs can flex and move down? A. Yes.

Q. And it is your opinion, then, in the Maynard patent that also takes place, that these webs can flex, and the part corresponding to the web 25 of Jardine being able to flex, the surface can move downwardly? A. Yes.

The Master: Move inwardly?

The Witness: Move inwardly in Maynard's.

Q. And it is your opinion that is true even though the web may be a quarter of an inch long or as shown as, for instance shown in the Maynard patent, and as shown in Exhibits 1 and 17? A. Yes, it is true of the construction of the Maynard patent. I mentioned, I think, the several factors contributing to the compensation for the excessive expansion in Maynard, of which flexibility is one, and a most important one.

Q. And if the keystone relief on Exhibit 1, for instance, were filled in so as to fill the web, flexing would take place of that short little web now together, the same as in the Jardine patent? A. Well, if there were no flexing in the web, there would be flexing in the skirt.

Q. But the flexing of the skirt itself would take care of any direct pressure due to elongation of the web irrespective of whether the web was flexible or not? A. It might not.

Q. As a matter of fact it is necessary, therefore, to cut that relief in the pistons like Exhibits 1 and 17 to take care of that very condition? A. Well, it is found desirable to do that.

Q. Well, it is done in every piston that is made like Exhibits 1 and 17 today? A. I think so. I think that is the practice in most of the pistons today, at any rate.

Q. And the relief must be the greatest at the top and can decrease to practically zero at the bottom; isn't that right? A. Well, the relief need not be greater at the top than at the bottom of the relief portion, but it is desirable to have as much bearing area as possible, and to gain any bearing area the wedge or keystone shape, as you have termed it, is desirable, with that web construction shown in Maynard

Q. And it is your opinion, then, that Figs. 1 and 2 of the Maynard patent show this relief as in Exhibits 1 and 17? A. They do not show the relief in just the same way as it is in Exhibits 1 and 17 but they do show the relief extending past the ends of the horizontal slots.

Q. As a matter of fact there is no relief, that is a depression, on the surface of the skirt at all in the Maynard patent as illustrated? A. Not on the portion that is touching the cylinder wall, but there is relief of the general area around the boss.

Q. But as a matter of fact the most that you can make out of the Maynard patent is that the web E might be inclined to correspond to the keystone as in Exhibits 1 and 17? A. Well, it is so inclined; it is so shown.

Q. Well, is it your opinion, then, that that would make any difference at all, whether the web is straight or whether it is inclined, so far as the pushing out effect is concerned? A. No, I think very little in that particular case. That is the effect of the so-called keystone shape would be to reduce the area of the bearing surface at the top of the skirt and increase it toward the bottom of the skirt. And of course the reduction of the bearing

area at the top of the skirt is helpful in compensating for the extra expansion at the top.

Q. But the mere inclination is the same, has the same effect as though you dropped a vertical line right from the top where the skirt edge joins the web? A. Insofar as the flexibility is concerned?

Q. Well, yes, as far as the flexibility is concerned? A. Yes, I think that is correct.

Q. Well, as a matter of fact you don't have a relief, that is a depressed portion of the skirt, a depression in the skirt, in the Maynard patent structure at all, that is a depression in the skirt between the connection of the web and the skirt and the face of the skirt proper; you don't have that illustrated in the Maynard patent, do you? A. Not exactly as shown in Plaintiffs' Exhibit 1, but that whole boss section is generously relieved.

Q. Well, the boss section was very generously relieved in the Ricardo piston, wasn't it? A. Yes.

Q. And you even had overhangs going beyond the skirt, like slightly shown in the Maynard patent, isn't that right? A. Yes.

Q. Where is the action, then, in the Maynard patent structure as far as taking care of the pushing out of the webs against the cylinder wall, different than in the Ricardo structure? A. The Ricardo structure is a rigid structure.

Q. But this closing on this slot don't come into play at all to take care of that pushing out action of the webs, does it? A. Not in Ricardo.

Q. It doesn't come into play at all in the Maynard structure? A. Yes.

Q. In what way does it come? A. There is a slight undercutting, even in the drawings of Maynard, as shown, in the web, and insofar as that horizontal slot is cut back into the web, then the flexibility of the web itself makes the correction. The matter of how far the web is cut into is one of degree, and inasmuch as there are several things contributing to the compensation for the expansion at the top of the skirt in Maynard, that flexibility feature at the top need not be as great as it is, for example in Golick.

Q. Referring to the drawings that you produced, or, rather, the blueprints, Exhibits 21 and 22, and particularly 22, there is a distinct relief shown where appears the lettering "1/8 to 5/32" followed by "H" in a circle? A. Yes.

Q. And that is about the relief that you have on Exhibits 1 and 17, isn't that right? A. Yes, that corresponds pretty closely to that relief. I think the relief is the same, however, from top to bottom of the relieved portion.

Q. Yes, but you have previously said, I believe, that it don't make any difference whether that relief goes down straight the full width, or tapers; isn't that right, it don't make any difference so far as mode of operation is concerned? A. I think I did say that it was preferable to have the taper, that is, you gain the larger bearing area, for one thing, but this piston, which is the Willys-Overland piston, I think has approximately the straight up and down sides of the skirt adjacent the relief after it is finished.

Q. But that relief isn't shown in the drawings of the Maynard patent now, is it? A. No, that particular type of relief is not shown there.

Q. Now, you said that from 1916 to 1919 you had conferences with engineers in the automotive industry including Col. Vincent, that is Jesse D. Vincent? A. Yes.

Q. Did he suggest anything? A. In the way of solving this difficulty he suggested nothing that was of any moment, at any rate. That is, in connection with solving the expansion difficulty. He did, however, have the Packard Company work out a design with an oil groove at the bottom of the skirt for the purpose of avoiding excessive oil consumption.

Q. Didn't he suggest the provision of slots a good deal like in the Franklin piston, Exhibit B? A. No.

Q. And when did you have your conference with Mr. Ferguson of the Pierce-Arrow? A. I had several conferences with him from 1916 to about 1920, as I recall it, or about 1919.

Q. And the Franquist type of piston was never mentioned? A. Not that I recall.

Q. You said that the Jardine piston was used or tried out, I don't know which, in the Templar car in Cleveland? A. Yes.

Q. The aluminum Jardine piston? A. Yes.

Q. Did it ever get into production? A. I think not.

Q. The specific Jardine construction was then dropped after the Maynard construction came out, is that right? A. Yes, to the best of my knowledge.

Q. Have you any Jardine structures, or structure, as shown in the patent, that you can produce? A. I

think so, not here, but I think I can produce such a piston.

Q. Could you produce the Ricardo structure and the Jardine structure tomorrow afternoon? A. Jardine and Ricardo.

Q. Those that were actually tried out, or something so we can see something in metal, see what it looks like? A. I will try to.

Q. Now, one of the distinctions you made between the Jardine and the Ricardo piston was that the webs were thicker in the Ricardo piston and therefore gave a rigid structure as distinguished from a flexible structure; is that right? A. Yes, I said that Ricardo was designed for rigidity whereas the Jardine construction aimed at flexibility.

Q. Even when the webs 3 of the patent which bridge the main webs corresponding to 25 of the Jardine patent are omitted? A. Yes, that is still true.

Q. Now, those webs did not seriously interfere with rigidity, did they? A. The Ricardo webs?

Q. Those webs C-3 referred to? A. No, they wouldn't interfere with the rigidity. They would make the structure even more rigid.

Q. They wouldn't interfere with flexibility, if it was split, such a Ricardo piston was split as shown for instance at 30-30 on Fig. 8 of the Jardine patent? A. Oh, they would militate against flexibility, yes.

Q. They wouldn't prevent flexibility? A. They wouldn't prevent there being some flexibility.

Q. Wouldn't a structure, if it had those webs, be flexible enough for use? A. I think not, not with the Ricardo sections.

Q. Well, if the webs themselves corresponding to 25-25 of the Jardine piston were made flexible enough, they wouldn't militate against flexibility? A. Yes, if the Ricardo piston is made to the Jardine piston, and the slots put in, of course there would be the flexibility of the Jardine piston.

Q. In Plaintiffs' Exhibit 8 Ray-Day piston there are two good sized ribs on the inside, and those two together give greater stiffness than any single web or rib C-3 of the Ricardo piston, is that right? A. Well, I don't conceive that they would, because the Ray-Day piston has the skirt separated from the head around the whole circumference, and the skirt portion of the Ray-Day is in itself inherently quite flexible.

Q. Isn't the skirt or around the slippers of Ricardo separated from the head all around? A. Not in the sense that they are in the Ray-Day construction. But the Ricardo construction, if made even without the web, would be comparatively stiff, rigid, but even so it would have flexibility.

Q. You believe then that if the structure as shown in Fig. 2, page 274, of The Automobile Engineer, Exhibit 3-S, were split, that is, split between the web, and with the parts of those dimensions, that there wouldn't be sufficient flexibility to do any good? A. I wouldn't say that. I think the drawings shown there in Fig. 2, show somewhat smaller sections than are shown in the Ricardo patent, for one thing, and I suppose nothing short of a trial would demonstrate whether there is enough flexibility there or not.

Q. Well, you have given your opinions freely—I think you are capable of giving your opinions—you would say, wouldn't you, there would be inherent flexibility in those webs enough that if the slipper were split between the webs, those webs would flex sufficiently to have the slot close somewhat? A. I think the construction shown in Fig. 2 of the publication which you have in your hand would show considerable flexibility if the vertical slots were put in the thrust faces.

Q. Those webs are also thin enough to flex, aren't they, as shown in that publication? A. I think so.

Q. In other words, there is inherent flexibility in a structure like the Ricardo structure, as shown in that magazine, isn't there? A. Yes, there was inherent flexibility in the old trunk type piston skirt, so there is inherent flexibility in the Ricardo construction with certain web thicknesses and certain skirt thicknesses.

Q. But Mr. Jardine particularly describes that the webs decrease in thickness toward the wrist pin bosses, isn't that right? A. Yes, he did describe that as his construction.

Q. And that lends to greater flexibility? A. Yes.

Q. Your conclusion, therefore, that the mode of operation was different and that the result was different as between Jardine and Ricardo is based upon the fact that there are no slots in the Ricardo piston? A. Yes, if you take the case of what might be called a modified Ricardo, that is the essential difference in mode of operation.

Q. And if you split almost any Ricardo slipper vertically, no matter what the thickness is, that is the thick-

ness that is ordinarily used in the Ricardo piston at that time, you would have enough inherent flexibility there to be operative in an engine, isn't that right? A. Yes, I think that is not a fair conclusion. That is, there first had to be the idea of making a piston of that construction operate satisfactorily, that idea utilizing the flexibility due to cooperation of the horizontal and vertical slots; and then there had to be the matter of proportioning the various parts so that that flexibility would be proper to properly operate in the motor.

Q. In other words, to you it seems that the first thing that should occur is the idea that there should be flexibility of the ribs? A. No, that seemed to be about the last thing that occurred to the people actually working on it, and certainly it didn't occur to the Ricardo people. They tried to make this thing work as they said it ought to work in an engine, which is a rigid box structure with non-flexible webs and skirt constructed as one unit.

Q. Did you say that the Ricardo piston is a two-walled structure? A. Only in part, the part at the head portion is doublewalled, whereas one of the structures shown in Jardine is a single-walled structure all the way up.

Q. In other words, Figs. 1 and so forth, on sheet 1? A. 1 and 2.

Q. 1 and 2 of Jardine are two-walled structures because the web comes up to the head; is that right? A. That is correct.

Q. And by springing the webs from the ring flange it makes a one-walled structure; is that right? A. Yes.

Q. And it was entirely possible to make the Ricardo piston in a permanent mold nevertheless? A. It was worked out, yes, as a permanent-molded piston.

Q. And the distinction between the Ricardo piston and the Gulick piston is, again, that the Gulick webs are flexible and Ricardo's weren't made that way for flexibility; is that right? A. That is one of the distinctions; of course there are others.

Q. The webs extend from the head in exactly the same way as in the Ricardo piston—I don't mean exactly, —I mean generally the same way? A. Yes.

Q. And one of the differences is that the outside of the skirt, that is, the part outside of the webs is left off in the Ricardo piston? A. Yes; by relieving a portion of the Gulick construction, namely the side walls at the

skirt in a certain manner, one would have a structure simulating the Ricardo at least, but it would still be much more flexible in a lateral direction than Ricardo.

Q. And flexible because there is a split between the webs? A. Flexible because of the split and because of the design of the webs to produce flexibility.

Q. In other words, there must be deliberate design of the web to produce flexibility? A. I don't know that there must be deliberate design to produce flexibility, if the design is capable of doing that, but there certainly must be a correct proportioning of the different parts as to location and thickness in order to produce the desired results.

Q. You cannot rely upon the inherent flexibility of any given structure, then, to produce that result, can you? A. No, I think not.

Q. Now, as far as the Maynard patent is concerned, if I understand your position, the distinction between Maynard and Ricardo, in addition to the distinction which you have pointed out with reference to Jardine, is that there is a ring at the bottom of the skirt? A. That is one of the differences. Of course I mentioned also Maynard is the single-walled construction.

Q. Yes; I intend to include all the differences of Jardine. A. That is correct.

Q. And it is your opinion, as far as the Moore patent is concerned, that Ricardo uses the principles of the Moore patent? A. In part, yes. He has the head connection by means of the connectors going to the bosses, so that the boss section is expanded more than it would be if it were not for the horizontal slot; and he has relief around the bosses so that this expansion can be utilized to assist in taking care of clearance.

Q. You consider relief in the region, for instance, of the wrist pin bosses, where the connections with the skirt are made as shown in the Moore patent, the equivalent of simply a pair of webs, separated, moved inwardly, and connected to the head, as in the Ricardo piston? A. No, they are not the equivalent for everything; but the functioning of the Moore structure in so far as thermal distortion and mechanical distortion of the top of the skirt is concerned, will take place to an extent in the Ricardo.

Q. And I believe you said—correct me if you haven't said so—that the length of the slot, too, of the Jardine patent, is a matter of degree? A. Yes.

Q. How much of a slot will you need in order to still perform the function? A. Well, I must go back to say 1919 or 1920, according to my own recollection, and say at that time that no one could say how much of a slot would be needed, and I may say to-day that the proportioning of the slots and the sections and the reliefs are the result of a great deal of effort and a great amount of experience, and that different degrees of flexibility are required for different constructions, and different degrees of flexibility are required in different sizes of cylinders, and different degrees are required in the different specific designs of pistons.

Q. Would you say that a slot extending inwardly or a slot like 29a on the Jardine patent Fig. 4 extending inwardly, about as much as shown in Fig. 2, page 274 of Exhibit 3-S, is such a slot as contemplated by the Jardine patent? A. Well, in view of the somewhat thicker sections of metal in those webs, in view of the cross-rib between the webs and on the inside of the piston head, and in view of the shortness of the horizontal slot to which you referred, I should say that that particular structure would lack the flexibility.

Q. You don't think that the web by which you probably mean the parts shown at X, which I will mark "X," can materially affect the flexibility, do you? A. Yes, I think it does, especially at the top of the skirt. It would not materially affect the flexibility at the bottom of the skirt.

Q. You think it affects it more than like, for instance, the webs 27 and 27a of Jardine, Fig. 7, and the webs shown at the top of the piston in Fig. 2 of the Gullick patent? A. Yes, I think the webs in the drawing to which you referred, ties the inside walls of the vertical webs together in the manner desired for a rigid structure.

Q. Isn't it a fact that as far as the Gullick view, for instance, is concerned, the parts above the wrist pin bosses are supposed to be rather stiff? A. That is true to an extent of Figs. 1 and 2, but the construction shown in Figs. 5 and 6 is more flexible.

Q. Fig. 1 of Exhibit 3-S corresponds in general to the drawings of the Ricardo patent 1,394,833, does it not? A. Yes, they correspond fairly closely.

Q. Would you say that the objects and advantages and purposes of the Jardine patent are secured if the

slots 29 were shortened to terminate about the inside part of the ring flange 23? A. It would be quite difficult to secure successful operation under those conditions.

The Master: We will recess now until 1:30 tomorrow afternoon.

(At 1:30 p. m., Tuesday, January 24, 1933, the hearing was resumed. Same appearances as last noted, and RAY JEFFRIES resuming the stand:)

Q. Doctor, in your discussion of Defendants' Exhibits BBB and CCC, comparing them with the patents in suit, you laid stress upon the strengthening of the walls inside and above the wrist pin bosses. That adds additional strength to that point, doesn't it, in each of those? A. Yes, it does.

Q. Now, if such a piston has horizontal slots in it going through the wall, it is of course necessary to strengthen the piston structure at the attaching point? A. Well, whatever is necessary to make the piston function so that all these things work together in the proper way, is done, that is true.

Q. That is quite usual, isn't it, to strengthen the parts by ribs where you want to strengthen it, where you have two connected parts in order to make a firm, strong connection, to provide a rib or an enlargement at the point of connection? A. If strength is the only factor to be taken into consideration, that can usually be done by strengthening the material itself, or changing the section.

Q. Wouldn't you say that was one of the purposes of adding those inside reinforcements to Exhibits BBB and CCC? A. Yes, that is one of the purposes.

Q. Particularly so where generous reliefs are provided in the region of the wrist pin bosses? A. Particularly so in those particular structures, more particularly in BBB.

Q. Because the slot extends all the way around? A. Yes. Yes, because the horizontal slot is relatively deep above the boss.

Q. But as a matter of fact the strengthening part is greater in CCC than in BBB; isn't it? A. Yes, as the piston is finished.

Q. As you see it, as you actually see it, the extension of the inside reinforcement is greater in CCC than in BBB? A. Yes.

Q. It is your position, then, that a structure like CCC, in which you have two horizontal slots below the ring lands and a relief opposite each wrist pin boss, causes this structure to embody the improvements of the Moore patent, leaving out now the vertical slot? A. Yes.

Q. It is also your position that as long as the vertical slot is provided, it incorporates the features of the Gulick patent? A. Yes.

Q. And also of the Jardine patent? A. Yes.

Q. You would consider the skirt part opposite the wrist pin bosses the equivalent of the webs in the Gulick structure? A. In so far as the flexing function is concerned it is the equivalent. It is not as effective as the structure shown in Gulick, but it is the equivalent of it at least in part.

Q. And you also consider that those relieved parts, that is, the metal left by those relieved parts in CCC are the equivalent of the webs of the Jardine patent? A. In function, yes.

Q. But not in structure at all? A. Not exactly in structure, no.

Q. And you would also consider the equivalent of the parts F in the Maynard patent? A. Yes, in so far as the function of flexing is concerned, and also relief, they are substantially equivalent to the Maynard patent. In so far as boss support is concerned, they would hardly be as good, that is, I would consider it an impairment of the Maynard boss structure.

Q. You would consider the skirt portion on each side of the vertical slot in CCC more flexible than those of Exhibit 1, I mean the entire skirt portions are severed by the horizontal slots? A. I should consider it somewhat more flexible than Exhibit 1.

Q. Both at the top and the bottom? A. No; merely at the top of the skirt.

Q. As a matter of fact in Exhibit 1 the bottom of the skirt which is mounted together with the part going across and on which the wrist pin bosses are mounted, form together an arc and a chord across the arc, don't they? A. Yes.

Q. And that is really a stiff construction? A. That is stiff in vertical direction, yes.

Q. Not in the transverse direction? A. Not so stiff laterally, no.

Q. You think it is as stiff laterally as Exhibit CCC? A. Oh, I don't know; I should say that both pistons would function substantially the same in a motor.

Q. Why do you say that the Exhibit CCC is more flexible at the top than Exhibit 1? A. It has a somewhat longer horizontal slot and hence longer lever arms for the skirt to flex in the vicinity of the skirt top.

Q. Exhibit BBB distinguishes from CCC merely by the fact that the division is all the way around; that is, the slots don't run out in the air but actually extend below the head of the piston so as to form an actual groove below the head of the piston; isn't that right; that is the distinction between CCC and BBB? A. That is the main distinction in so far as the structure is concerned, although Defendants' Exhibit CCC has a projection on the inside of the skirt corresponding somewhat in area to the relief on the outside of the piston around the bosses, which BBB does not have.

Q. Do you consider that the essential structure, function, and mode of operation of the two pistons, Exhibits BBB and CCC are the same? A. Broadly speaking, yes.

Q. Well, do they distinguish at all? A. They distinguish in the depth of the horizontal groove at the top of the skirt; the depth in BBB being considerably greater than that of CCC immediately above the bosses.

Q. When you say "depth" do you mean that in CCC the depth of the groove is zero, that is, above the bosses? A. There is no actual groove for a distance of approximately an inch above each boss; but the relief is carried to the ring section at that point, so that the bearing surface is not continuous around the skirt at the top in either of the pistons.

Q. In your opinion, then, it doesn't make any difference in the mode of operation whether there is a groove right directly above the wrist pin bosses below the top of the ring lands?

Mr. Richey: Referring to Exhibits BBB and CCC.

A. The mode of operation is substantially the same.

The Master: You have used an expression there I didn't understand, both the counsel and the doctor. You spoke about this slot extending out into the air. What do you mean by that?

Mr. Bruninga: What I mean in Exhibit 17 and also in Exhibit 1 is that there is a slot running

around the piston. Part of that slot is actually existing; the rest of it goes out into the air for 180 degrees.

The Master: It is not continuous?

Mr. Bruninga: It is not continuous at all.

The Master: That is what I wanted to be sure that I understood.

Q. I believe you said that the skirts of Exhibits BBB and CCC were thicker than necessary, particularly Exhibit BBB; A. Yes, I think so.

Q. Does that affect the flexibility of the skirt? A. Yes, it affects the flexibility.

Q. But in your opinion there is considerable latitude permitted say in thickness and still secure flexibility? A. It is not a question of the latitude and thickness solely; it is a question of the combination of the thickness, the extent of the horizontal groove, the vertical slot, and its position, the material of which the piston is made,—all of those things must co-operate together to get the proper fit in the motor at all temperatures. So if one thing is changed, it may require a change in other features in order to get the right combination.

Q. Why did you say that Exhibits BBB and CCC were more nearly like Moores; I believe you said that? A. Yes, the Moores principle is utilized in Exhibits BBB and CCC to a very great extent, and very effectively, especially on the maximum thrust face, or maximum thrust side of these pistons. The principle described by Moores is clearly used in these pistons. The head expands more than the skirt, the flow of heat is restricted to locations in the regions of the bosses, thus making those portions of the guide sections expand more than would otherwise obtain, and that in turn produces a distortion of the bearing section proper in the direction of moving the bearing face in toward the wrist pin. And in so far as that principle is effective, it permits of closer fitting of the piston when the motor is cold, with the compensation becoming greater as the piston is heated, in fact, just the time when compression is most needed.

Q. And that is because the connectors are rather narrow? A. That is because the connectors are narrow and because they act both thermally and mechanically to produce that result. That is also made possible only by the generous relief of the skirt section in the region of these connectors, as is clearly present in both Exhibits BBB and CCC.

Q. You would call the relief in CCC generous, then, would you? A. Yes, the relief there is so much that it can be felt easily with the finger, and it can even be seen with the unaided eye.

Q. Now, the reason you said it is more like Moocrs is because in Exhibits 1 and 17 you have rather wide connectors, don't you? A. Yes; the connectors are wider in Exhibits 1 and 17.

Q. Would you say rather wider or would you say they are about twice as wide? A. Oh, they are considerably wider.

Q. About twice, isn't it? A. I should think so.

Q. And still you consider Exhibits 1 and 17 as embodying that particular improvement of the Moocrs patent? A. Yes.

Q. In other words, in order to embody it, the connectors could be anywheres between Exhibit 1, for instance, on one hand, and Exhibit BBB on the other; is that right? A. I should think so, if the principle became effective.

Q. That is the principle of having reliefs, substantial reliefs opposite the wrist pin bosses and connectors from the head to the skirt? A. Well, it is a three-way combination: it demands a horizontal separation. It demands restricted connectors which act mechanically to pull the skirt out more in one place than another; and acts as a thermal connection to heat the skirt to a higher temperature than would otherwise obtain, which accentuates the distortion of the head. Now, all three of those factors are present in Plaintiffs' Exhibits 1 and 17, and they are all present in Defendants' Exhibits BBB and CCC.

Q. Doesn't Exhibit CCC look mighty like a trunk piston to you with horizontal and vertical slots in it? A. It is a trunk piston with life in it, yes, and a trunk piston that is so modified with reference to its boss connections and with reference to the proportioning of its sections and with reference to the presence of slots, both horizontal and vertical, as to produce an entirely different result and a different mode of operation.

Q. If you take the structure, Exhibit 3-H and put a T-slot in one face of this piston, with the horizontal of the T below the ring land and with the vertical of the T extending from the horizontal down to the end of the skirt, you would secure the structure in Exhibit CCC, wouldn't you? A. No.

Q. Why not? A. Because you would still have a dead piston, especially at the top of the skirt. Will you place the grooves and then I will tell you?

Mr. Richey: I object to this as immaterial; no such construction before the court.

The Master: He may answer.

A. (Continued) (After counsel indicates groove on Exhibit) No; that piston would still function like a trunk type piston, only perhaps worse.

Q. Because it has not the slots on the other side? A. No; because the slot is improperly placed; the horizontal slot is not placed there to do any good.

Q. What I have shown there is a horizontal slot below the top of the ring land and extending into the relief, and a vertical slot midway between the wrist pin bosses and extending to the ends of the skirt; and you say that would not produce a structure like Exhibit CCC? A. No, it would not.

Q. Why not? A. Because the maximum clearance is required at the very top of the skirt, and you have placed the slot at some distance from the top of the skirt and hence the portion which is slotted, namely, the band at the very top of the skirt, will require even more clearance than the ordinary trunk piston, because it will become hotter opposite the horizontal slot than the ordinary trunk piston, and the piston would seize or otherwise rub unnecessarily hard against the cylinder wall.

Q. But suppose I place the horizontal slot 1/8" below the ring groove, the lowest ring groove? A. Well, you are suggesting something there, I suppose the next question would be 1/16", and the next 1/32".

Q. Just answer the question.

Mr. Richey: I object to all this. We will never get through here if he is going to ask something that is not before the court.

The Master: He may answer.

A. If you move the slot into the proper position as taught by Jardine and by Maynard and as is present in various of these exhibits in suit, and otherwise proportion the structure as to section thickness and location of various slots, you may get the same result as is found in the structures in the patents in suit.

Mr. Bruninga: Answer objected to as not responsive. I move to strike out and that the witness

be required to answer the last question. Read the question again.

The Master: Motion overruled, and the answer may stand to preserve the record; but the witness will have the question again and be instructed to answer.

(Previous question read.)

Mr. Richey: You are talking about what exhibit?

Mr. Bruninga: Exhibit 3-H. I will ask the question again so there will be no misunderstanding.

Mr. Richey: He is not preserving this construction he is talking about. How are we going to have a check on it?

The Master: Well, he is defining his structure in his question.

Mr. Bruninga: I will reframe the question so that there will be no mistake about it.

Q. Suppose I cut a slot through the wall of the piston Exhibit 3-H, circumferentially and 1/8" below the lowest ring groove, running into the reliefs, and a vertical slot connecting with that circumferential slot and running to the end of the piston and placed midway between the wrist pin bosses. In what way does such a structure distinguish from Exhibit CCC? A. It still distinguishes by the fact that the horizontal slot is not properly located to gain the advantages of flexibility.

Q. That is your answer? A. Yes.

Q. And in order to answer it, you would want to give your previous answer explaining that it must incorporate Jardine, Maynard and Mooers and all these others? A. Yes, I would want that to stand.

Q. And that is the only answer you can give; you cannot be definite about it at all, how it should be placed? A. How the slot should be placed?

Q. Yes. A. Yes, I can be very definite.

Q. By metes and bounds, or quarter inches or one-eighth inches, one-sixteenth or one-thirty-second? A. No, not by hair splitting. I can give you the limitations of function and result.

Q. In spite of the fact there is not a dimension given on any of the drawings of Gulick, Mooers, Maynard and Jardine? A. Yes, in spite of that.

Q: You really don't want to answer the question, do you? A. I have answered the question, I think.

Mr. Richey: I submit he has answered the question.

Q. But you can't tell the Court, then, in what respect the structure that I gave you fails to function on account of location of the upper slot, whether it should be one-eighth inch or one-sixteenth inch, or what the length should be with reference to how far it should go into the reliefs? A. No, I cannot define those boundaries, and furthermore I know of nobody that can define those boundaries in a structure of this sort (indicating Exhibit 3-H). People may think they know a lot about calculating stresses and so forth, but it has been my experience in connection with this piston business that there has been very little forecasting of what a particular piston construction would do in a motor. The answer, even by the best mathematicians, has been gained by tests. So when a patent describes that a piston should operate in a certain way, and when it discloses a structure which will operate in that way, I think that that in itself is significant, that is, there is a structure which does what the patentee requires of it. Now, this iron piston that you referred to, Defendants' Exhibit 3-H, if slotted horizontally as you indicated, say three-eighths of an inch or more than a quarter of an inch below the top of the skirt, I am certain about that, that is that the upper band of the skirt will still expand to the same extent or to a greater extent than it would in a trunk piston, and that that is the very region where the expansion is the greatest and where compensation for the excess expansion must be provided to the greatest extent, or at least to a sufficient extent; so that as you move the slot gradually upward, you finally put it where Jardine puts it and where Maynard puts it, in a place clearly above the upper part of the skirt, and then it functions.

Q. You think that can be determined from all the patents in suit? A. This business is still quite an art and it was very much more so before these patents in suit, so that when you ask me a question of that sort I am unable to give you any broad answer. The patents in suit do teach these principles of operation, the general lines of construction, and the result.

Q. That is all you want to tell us of how you locate that slot? A. Yes.

(Short recess taken.)

Q. Doctor, I believe you said that in Exhibit BBB and CCC the top of the skirt was more flexible than in pistons 1 and 17, but that the bottom had about the same flexibility? A. Well, as near as I can tell from feeling it.

Q. I don't mean by feeling. You get that from the general structure? A. No, I get flexibility from feeling.

Q. Now, it is the top where the greatest flexibility is required, isn't it? A. Not necessarily. It is the top where the greatest compensation for clearance is required, but if that clearance is compensated for by means other than flexibility, then the flexibility would not be required to a greater extent at the top than it is at the bottom.

Q. Well, you really get flexibility at the bottom, good flexibility, by a construction such as Defendants' Exhibit BBB, don't you? A. Yes, it is no trouble to get flexibility at the bottom of the skirt, if that is all that is required.

Q. In fact, you can get that by a single slot between the wrist pin bosses, going part way up the skirt, say above the region of the wrist pin bosses? A. Yes.

Q. I believe you said on re-direct examination that the piston, Exhibit 20, the Gulick piston, was very flexible? A. Yes.

Q. And I believe you also said the larger the piston the more flexible it will be? A. Yes, that is correct. It is easier to get flexibility in a large piston than it is in a small piston.

Q. And that flexibility is particularly required in the large piston, but not particularly required in the small piston? A. It is required in all sizes of pistons for pleasure cars at the present time where aluminum alloy is used for the piston.

Q. But that is the fact, isn't it, that the flexibility for a small piston, such as Exhibit 20, is not as great as for a piston of the size of Exhibits 1 or 17? A. Well, the extent of clearance compensation in thousandths of an inch is not as great in a small diameter piston as it is in a large.

Q. In fact the clearance required for even aluminum pistons is usually measured in thousandths per inch diameter, isn't it? A. Yes, or thousandths per diameter of the piston.

Q. But automotive engineers have in the past at least taken the position that the clearance should in-

crease as the diameter increases, if there is no compensation for clearance? A. That is correct.

Q. Have you ever tried out a piston like Exhibit 20, or as large as Exhibits 1 and 17? A. No, I have not.

Q. I show you a piston which I will mark for identification Defendants' Exhibit 3-T, which I believe is a fair exemplification of the structure of the Gulick patent. You can look at it, and, again, I don't want to tie you down to dimensions till you have measured it, but I will say that that corresponds to the half section, Exhibit 3-R; I am sure they were made in the same mold, with the same pattern. That corresponds generally to the Gulick patent structure, doesn't it? A. Yes, it corresponds generally.

Q. Now, Exhibit 3-T, the Gulick piston, as well as Exhibit 3-Q, the Franquist piston, and Exhibit 3-P, the Spillman & Mooers piston, each have a wrist pin in it that naturally makes the structure stiff, doesn't it, if the wrist pin is in pretty tight in the bearings? A. Well, one can freeze the wrist pin in the bosses and make the structure tighter, that is correct.

Q. Well, you can examine these and see that the wrist pin is not loose in those bosses; that is a fact, isn't it, in all three of these pistons? A. Yes, the wrist pins seem to be in unusually tight, in fact, frozen in there.

Q. That naturally makes the piston structure stiffer than if the wrist pins were left out entirely? A. Yes, it does. That is not a fair fitting of wrist pins, in these structures, however.

Q. You think it is too tight? A. I am sure it is too tight.

Q. Just how loose should a wrist pin be in a piston? A. Well, in an aluminum boss or where at least the boss is supposed to serve as a bearing, it must be loose enough so that it will not freeze even at sub-zero temperatures, because the motor is supposed to stand out and be able to function at sub-zero temperatures. So that if the wrist pin is expected to bear in the boss in the Gulick piston, for example, it is too tight as it is at the present time.

Q. Well, you would say it is then also too tight in the other pistons? A. Well, in the Franquist piston, perhaps this is intended to function tightly, maybe in the Gulick. I don't know whether you have this set for

a fixed wrist pin or whether you have it set for a wrist pin which is supposed to bear in the aluminum bosses.

Q. But fixed wrist pins are usually set pretty tight? A. Oh, fixed wrist pins can be set quite tightly, yes.

Q. Is it your opinion that in that Gulick structure the wrist pin was intended to be set tight? A. In the principal drawings, yes, Figs. 1 and 2, there appear to be the two places for the locking of the wrist pin. In the lower drawings Figs. 5 and 6, there appear to be no means shown, at least, for locking the wrist pins

Q. But in the Mooers patent it is intended to be clamped in by screws? A. On one side only.

Q. But as you read the drawings, in Figs. 1 and 4 of the Gulick the wrist pins are intended to clamp in, aren't they? A. Apparently, yes.

Q. Well, it is your opinion, isn't it, that the pistons will function with wrist pins clamped in that way? A. Yes, I think they will.

Q. Function as you have described? A. Substantially. If the locking is too tight, that reduces the flexibility, especially around the bosses.

Q. Well, wherever set screws are used, there is no loose fit, is there, there is a pretty tight fit? A. Well, there should not be any looseness, especially in the cold.

Q. You haven't shown a wrist pin in Exhibit 20, and you would therefore expect the structure to be more flexible than if there was a wrist pin in there; isn't that right? A. Yes, it would be more flexible than if the wrist pin were fitted in.

Q. And in that model as you have shown it, those wrist pin bosses are intended to receive set screws? A. I think not. In this case I think the holes there are probably oil holes.

Q. Examine it again, please, and tell me if you would put a boss around an oil hole? A. I think the boss was put on there, perhaps merely because it is shown in the Gulick drawing figures 1 and 2, but I find no threading about those holes, so consequently I conclude they are oil holes.

Q. But, answer my question: naturally you would not put a boss around just because you had an oil hole? A. It wouldn't be necessary.

Q. In fact that boss indicates it is intended to receive a set screw? A. Yes, I said that before.

Q. Now, these structures, Exhibit 3-P, 3-Q, and 3-T, are they more stiff if they do have the wrist pins in

them? A. Yes, and more especially so in the cross section of the skirt through the wrist pin and in the wrist pin regions. The flexibility of course would be greater away from the wrist pin in both directions, up and down. That is true of the Gulick construction, but what I have said earlier with reference to the Franquist and Spillman & Mooers constructions would still obtain, namely, that the flexibility of the Spillman & Mooers is quite low at the bottom of the skirt, even when it is provided with a vertical slot between the bosses connecting the bottom of the skirt and the horizontal slot.

Q. But you would expect the stiffness of Exhibit 3-P to be less if the wrist pins were taken out entirely than it is in Exhibit 20, isn't that right? A. Yes, it would be somewhat less, at any rate.

Q. But still the flexibility of the skirt at the top in the Spillman & Mooers piston 3-P is rather high, isn't it? A. Yes, it is.

Q. And there is some flexibility at the bottom? A. Yes, but in my opinion not enough to do any good insofar as effective clearance is concerned.

Q. And you found that upon what you know of engineering in pistons, and not upon actual tests with the Spillman & Mooers patent structure? A. I deduce that from the tests with my hands. I have flexed perhaps hundreds of pistons of various kinds and sizes with my hands, and I think that is a rough test. I have learned to tell from hand-flexing whether the flexibility is of the right order of magnitude, at least for motor operation.

Q. You have never really tested a Spillman & Mooers with a split skirt, although royalties have been paid under that patent by the licensees, and although suit was filed against the Simmons Company on that patent on account of the alleged infringement of a structure exactly like Exhibit 1?

Mr. Richey: I object to the question. It contains a lot of attempted testimony by counsel, and statement of facts that haven't been proven in this record.

The Master: He may answer; same ruling.

Mr. Buninga: You mean to say, Mr. Richey, that you don't admit that any royalties have been paid under that Spillman & Mooers patent on structures exactly like Exhibit 1?

Mr. Richey: No, I don't admit it.

Mr. Bruninga: And you don't admit that a structure exactly like Exhibit 1 was in the Simmons case?

Mr. Richey: I say if you want to prove these things you must get proper proof, so as to get both sides in.

Mr. Bruninga: You have admitted it before.

Mr. Richey: I haven't admitted it.

Mr. Bruninga: You don't admit it now but you did admit it before.

Mr. Richey: If I did admit it I admitted it unconsciously. I neither admit or deny those things, so you will have to put in the proof.

Mr. Bruninga: You mean that was under a misapprehension, when I asked you if you would produce the record in the case and you said you didn't want to produce it but would admit it?

Mr. Richey: I don't remember saying it.

(Previous question read.)

A. I can't answer as regards the question, with the exception as to whether I have tested a Spillman & Mooers piston with a vertical slot in it. I have not tested such a piston except with my hands and with a so-called can-opener testing device, Defendants' Exhibit 3-I, in this case or in this suit. I do not recall that I have ever seen a Spillman & Mooers piston with a vertical slot in the skirt placed between the bosses and connecting the bottom of the skirt and the horizontal slot, prior to this suit and prior to seeing Defendants' Exhibit 3-P.

Q. The specification of the Spillman & Mooers patent 1,092,870 reads as follows, page 1, lines 71, *et seq.*: "In the construction illustrated in the drawings, the web is separated from the surrounding walls of the head and guide sections, by a comparatively wide space, and the upper end of this connecting web joins the back of the head sections, while its lower end joins the guide-sections near its lower end or at a point remote from the non-conducting gap 6, whereby the amount of heat transmitted through the web from the head to the guide-section is reduced to a negligible degree, not only on account of the remoteness of the lower end of the web from the gap, but because the web is constantly cooled by the large volume of oil in the crank case." Do you understand by that description that the structure should be exactly as indicated in the drawing, and that is the exact distance from the lower end as indicated in Fig. 2? A.

I don't know what latitude would be permissible in that connection.

Q. You have not had any trouble in telling us the latitude in connection with the patents in suit, have you? A. Yes, I have very considerable trouble.

Q. You think, then, that the statement that it joins the guide section near the lower end or at a point remote from the non-conducting air gap 6, would necessarily mean it is at the extreme lower end of the skirt, that connection, or might be higher up and still be remote from the top of the skirt? A. I don't know.

Q. You cannot answer that question? A. No.

Q. You said that the Spillman & Mooers piston cannot be fitted as close as the Gulick piston. You had in mind of course an unsplit structure, isn't that right? A. Yes.

Q. And can you give me or the Court your opinion as to whether that would be possible if it were split as in Exhibit 3-P? A. Oh, I think if you make a live piston out of the Spillman & Mooers by having the slots described by Gulick cooperate in the same way to produce the same mode of operation, that it would be possible to fit the Spillman & Mooers piston with smaller clearances than that of the disclosure of the Spillman & Mooers patent.

Q. But if there was no slot, vertical slot, midway between the wrist pin bosses connecting the bottom of the skirt with the horizontal slot, what would you then say as to close fit? A. That is what I supposed in my previous answer.

Q. You supposed that to be the change? A. Yes.

Q. And that is your answer? A. That applies particularly to the top of the skirt section rather than to the bottom of the skirt, however.

Q. The bottom of the Gulick skirt would be more flexible than the bottom of the skirt in the split Spillman & Mooers? A. Yes, very much more flexible.

Q. Now, with reference to the Mooers patent, one of your distinctions over the Spillman & Mooers patent was that the Mooers patent structure was a single-walled body, as distinguished from a double-walled body. That is also the distinction between Jardine and Gulick as to that—that is one of the distinctions between Jardine and Gulick; isn't that right? A. That is one distinction, yes, and especially one of the structures shown in Jardine.

Q. Now you also said another distinction between the Spillman & Mooers and the Mooers patent was that in

the Spillman & Mooers patent structure the relief was between the connections on which the wrist pin bosses are mounted and the skirt. That is also a distinction between Gulick and Jardine? A. I think I said that the relief in the Spillman & Mooers was hardly a relief. The hole is present there for the purpose of putting the wrist pin in place. It is not described, as I recall it, as a relief. But, even so, it would have in my opinion no function as a relief, the way it is constructed.

Q. You can say the same thing about Gulick, can't you? A. Yes.

Q. Now, in the Spillman & Mooers patent structure there are oil holes, 9, at the bottom of Figure 3? A. Yes.

Q. What is the purpose of those oil holes? A. To let the excess oil that might otherwise collect in the pocket between the web and the skirt escape.

Q. Where? A. Onto the cylinder wall.

Q. To be wiped by the lower part of the skirt against the cylinder wall? A. Yes, it would so function.

Q. You stated that you did not know at the time that you experimented with the Ricardo piston about the Gulick piston; I believe that is correct? A. That is correct.

Q. When did you find anything about the Gulick piston—when they took your deposition? A. A short time before that, yes.

Q. In 1926. Well, that was a considerable time after the Jardine piston was developed, isn't that right? A. Yes, it was some time after that, I don't recall the date, however.

Q. Now, one of your distinctions that you gave between the Franquist patent and the Gulick patent was that Franquist was a single-walled structure while Gulick was a double-walled construction. That is also the distinction between one of the accused devices, Exhibit 1, and the Gulick patent; isn't that right? A. That is one of the distinctions, yes.

Q. In other words, as far as that is concerned, the accused device, Exhibit 1, BBB and CCC are more in the direction of Franquist, I mean as to that one feature of being a single-walled construction? A. Insofar as that one feature of the construction is concerned, that is true.

Q. You said that the Franquist patent structure was similar to a trunk piston, and I take it that you mean that even though the Franquist patent discloses relief in the regions of the wrist pin bosses and in the connectors, not in the connectors but in the parts of the skirt around the

wrist pin bosses from a little below the wrist pin bosses to the top of the skirt? A. I did not have that feature in mind and I meant the head and the full skirt portion particular.

Q. And it is your opinion, even if the Franquist patent is made out of cast iron, it will have no flexibility at all? A. It will have insufficient flexibility to cause the piston to function substantially different from that of the trunk type piston, in my opinion.

Q. Is that due to the fact that the relief opposite the wrist pin bosses is insufficient? A. No, that is only one of the factors. The other factor is the rigidity of the vertical groove sections, and still another is the horizontal separation being put in a ring groove so that the ring has an opportunity to transmit heat across the gap formed by the horizontal slot.

Q. You think, then, that is the wrong place to put the horizontal groove in the ring groove? A. Not necessarily, it is according to what is desired of the horizontal groove.

Q. You wouldn't think that would be an impairment of function to put it in the ring groove rather than some place below? A. It would if the function desired is the Moocrs' function, that is, one of heat insulation; but it might not if the function is one of gaining flexibility, such as Gulick, Jardine and Maynard constructions.

Q. The Franquist patent states as to these grooves or slots, "Circumferential slots 17-17 are cut in the outer surface of the sleeve in the sections 15-15 respectively, while slots extend to and join the longitudinal slots of 13, separating the longitudinal sections 15 from the head of the piston." That don't specifically state the horizontal slot has to be at the bottom of the ring groove, and in fact we do not find anything in the patent that states they should be placed there except the illustration in the drawing? A. (After examining patent.) No, I see no other reference to its construction in the specification.

Q. As a matter of fact in the Ford Eight piston, Defendants' Exhibit 3-J, the horizontal slot is placed in the lowest ring groove, isn't it? A. Yes, it is, and in that piston the Moocrs principle does not apply anyway on the slotted side.

Q. Does it apply on the unslotted side? A. No, not on that piston because there is no horizontal slot on the side which is not vertically slotted.

Q. And in the Chrysler piston, Exhibit 3-O, you find the same thing, and therefore your answer would be the same?

Mr. Richey: I object to this as immaterial.

The Master: Same ruling.

A. The same as has been said of the Ford piston applies to the Plymouth piston with reference to Moores.

Q. Now, in your opinion the grooves in the Franquist patent structure are not sufficiently flexible to be operative in order to compensate for expansion, is that your position? A. Yes.

Q. And in spite of the fact that the patent specification specifically states that the structure is flexible? A. Yes, he was just wrong.

Q. Absolutely wrong? A. For practical purposes, yes.

Q. In other words, that is just an ordinary trunk piston, in force and effect? A. Why, probably worse than a trunk piston.

Q. But you do know that The Cleveland Trust Company has been drawing royalties under that patent?

Mr. Richey: Object to it as immaterial. The records are the best proof. This witness don't know.

A. No, I don't know that.

Q. You don't think, then, the vertical grooves of the Franquist patent structure are the equivalent of the vertical slots of either the Gulick, Maynard or Jardine? A. No.

Q. I believe you said that the relief as described in the Franquist patent was not sufficient for use with aluminum alloy, is that right? A. That is correct.

Q. Because it is stated to be so many thousandths inches deep? A. Yes.

Q. But you would have to use a larger or smaller relief when you use aluminum as compared with cast iron? A. Well, so far as my knowledge goes, the relief structures for that purpose haven't been used on cast iron, or at least haven't been necessary.

Q. Is that your understanding of what the practice in the art has been, that the reliefs have not been used on cast iron pistons? A. Not been for the purpose used in the patents in suit, that is my understanding. There has been relief in the cast iron pistons around the boss sections. My understanding is it is to take care of the mechanical weaving action of the skirt adja-

cent the bosses as a result of the stresses due to the explosion stroke and the inertia forces.

Q. That has also been your understanding where aluminum trunk pistons were used? A. In some cases, yes.

Q. But the practice has been to make those reliefs deeper when aluminum trunk pistons were used than when the cast iron trunk pistons were used? A. No, I think not, not in the case of the trunk pistons, that is not in the instances where both of the pistons are in the trunk type.

Q. It is your idea then that Mr. Franquist should be tied right down to the exact dimensions he has stated as to the depth of the relief?

Mr. Richey: I object to that as immaterial; that is something for the Court to define, the interpretation of the patent.

The Master: I think that should be sustained.

Mr. Bruninga: This witness has stated the relief as stated in the patent is not sufficient to accomplish the purpose. I asked him whether he should be tied down to that.

The Master: I will make the same ruling, let him answer and you may have your exception.

A. I don't know what latitude is permissible.

Q. And it is your opinion then that as far as Exhibits 1 and 17 are concerned, the flexibility at the top of the skirt is greater than the flexibility at the top of the skirt in the Franquist patent structure? A. Yes, very much so.

Q. Is it, again, founded upon opinion rather than upon actual tests in an engine? A. No. I would say we have a tremendous amount of commercial art to the effect that pistons like Plaintiffs' Exhibits 1 and 17 and Defendants' Exhibits BBB and CCC function properly in motors, and inasmuch as there is a tremendous amount of commercial art in those directions, that I assume to be established as a fact, that such pistons are commercial and satisfactory in service.

Q. It is then founded upon what you know of other pistons and not upon any actual tests with the Franquist piston, is that right? A. I have run no actual tests on the Franquist piston, that is true, so far as motor operation tests are concerned. I have conducted some stiffness tests on the Franquist piston and I am convinced that the circumferential flexibility which the patent

specification of Franquist claims, is substantially absent in the Franquist structure as described, and also in the Franquist structure Defendants' Exhibit 3-Q.

Q. When did you make those tests you talked about yesterday with the Franquist piston? A. 1931.

Q. Here in Cleveland? A. Yes.

Q. What was the occasion for making those tests? A. Made the tests at, as I recall it, about the time the Simmons suit was under consideration.

Q. And you found the Franquist piston worthless at that time? A. I didn't say I found it worthless. I think it would probably be as serviceable, generally speaking, as a trunk type piston, maybe not quite as good, but it is true we found the features claimed in the patent specification to be substantially absent, especially as regards the main feature, that is, circumferential flexibility.

Q. Was that before or after the settlement of the Simmons suit? A. That was before.

Q. Who told you to make those tests? A. I made them under my own—I made the tests because I wanted to make the tests. I wanted to satisfy myself as to the Franquist structure.

Q. Did you report those tests to Mr. Richey or to Mr. McCoy? A. I believe not until quite a bit later.

Q. Before or after the settlement of the suit? A. After the settlement of the suit.

Q. And how did you make those tests, with your hands or with a clamping device? A. I made those tests with a clamping device and a testing machine, and a micrometer.

Q. What kind of a testing device, was it along the order of Exhibit 3-I? A. No, it was the regular tension and compression testing machine. The piston was set in a testing machine with bearings at two sides near the bottom of the skirt, and the deflection and load were measured. First, I found the amount of load required to deform the piston in that direction by ten thousandths of an inch. The measurement was made in two directions at right angles to each other. It was found that the load required to stress this piston, or the stress or load required to deform the Franquist type piston .010" was from 100 to 120 pounds. Next I removed the piston and applied a C-clamp across opposite faces at the bottom of the skirt and deflected the piston .010" the same as it had been deflected in the testing machine. Then I

measured the diameter at right angles to the points of contact of the C-clamp and found that the skirt had expanded in a direction at right angles to the points of pressure to approximately the same extent as another type of piston with a non-flexible skirt bottom. Therefore I concluded that the functioning of this Franquist type skirt is substantially that of the trunk skirt.

Q. Can you tell me a little more accurately when you made those tests? A. Yes, I can. It was September 24, 1931.

(Short recess taken.)

Q. Dr. Jeffries, what was the occasion of making that test on September 24, 1931? A. I was testing the various structures which were under consideration in the Simmons suit.

Q. And that date was the day before the so-called proceedings in chambers before Judge Jones were proceeded with, that you really expected to go to trial on that Simmons case? A. It was just a short time previous. I don't know whether it was the day before or not.

Q. But you were really getting ready for the trial in the Simmons case, is that right? A. Yes.

Q. You knew the Franquist patent was involved in that suit? A. Yes.

Q. You were getting ready to testify as an expert with reference to that Franquist patent? A. Possibly, that is, there was a possibility I would testify.

Q. And you were in rather close conference with Mr. Richey and Mr. McCoy just previous to the trial, weren't you?

Mr. Richey: I object to that as immaterial and having nothing to do with the issues of the case.

The Master: Same ruling; you may have your exception.

A. Yes, I had one or more conferences with them previous to the trial.

Q. Did you tell them previous to the trial that this Franquist piston was no better than an ordinary trunk piston? A. No, I was in fact quite surprised myself. The piston is quite deceptive in looks. Somehow or other that construction looks as if it should be flexible, and I had assumed it was flexible, and I was first struck by the apparent rigidity of it with the hand test and I

wanted to get some kind of a quantitative measurement on it, and I was quite surprised to find how rigid it was.

Q. Can you tell me more accurately the date when you reported that matter to any attorney for the Aluminum Company of America or the Cleveland Trust Company or any of the licensees? A. Well, I should judge it must have been at any rate three or four weeks after I made the test.

Q. But it was within three or four weeks after you made the test? A. I think so.

Q. Who did you report that matter to? A. Well, as I recall it, to Mr. Richey and Mr. McCoy.

Q. Now, in making that test did you make up a piston exactly in accordance with the dimensions as shown in the Franquist patent? A. I didn't measure the dimensions. I used a piston which was supplied by Mr. McCoy.

Q. You didn't even measure the dimensions, then, whether they corresponded with the drawings of the Franquist patent? A. The piston looked as much like the drawing of the patent as Defendants' Exhibit 3-Q.

Q. But you didn't compare the dimensions, did you? A. No.

Q. And you didn't try to make it work by proportioning the parts, more particularly the accordion pleats, as you call them, in order to secure flexibility? A. No, I made no changes in the piston as I received it.

Q. In Exhibit 1 there is only one slot, isn't there, vertical slot? A. Yes.

Q. In Exhibit 3-Q, the Franquist piston, there are four slots? A. There are four grooves in the ribs.

Q. Four grooves in the ribs, let's call them? A. Yes.

Q. And in order to get the same expansion, the closing of the slots can be divided among four—call them grooves instead of slots, if you don't like that word? A. Yes, that is correct.

Q. In other words as far as visual effect is concerned you might get the same, you would get the same compensation for expansion only if each slot closed one-fourth as much as a single slot, if there was only a single slot in the piston? A. That is true, but that does not mean that the flexibility would be four times as much for the Franquist type piston as a result of cylinder wall pressure. The forces tending to close the slots have to be taken into consideration, and of course those forces

act on larger or longer lever arms in Plaintiffs' Exhibit 1 than they do in Franquist.

Q. I believe you stated that for practical purposes the horizontal slot or groove extends completely around the Maynard piston below the head? A. Yes, in the construction shown in the Maynard drawing.

Q. And you can say the same with reference to the Jardine patent? A. Yes.

Q. And you really can say the same with reference to the Ricardo piston, can't you? A. Yes.

Q. The relief is really not needed in the Jardine patent structure because you already have a pair of webs to give you ample relief in the region of the wrist pin bosses? A. Yes, the structure provides its own relief.

Q. And that relief is also in the Ricardo piston? A. Yes.

Q. You talked about mechanical expansion and distortion, I believe, as distinguished from thermal expansion. I didn't understand what you meant by that. Can you briefly give me your position with respect to the Maynard patent structure or the Jardine patent structure to illustrate that? A. Mechanical distortion can be produced by mechanical force alone. The type of distortion which I described with reference to the Franquist piston test was mechanical distortion. I reduced one diameter of the skirt by .010" and increased other diameters at the same time. That was all done at one temperature, namely, room temperature, and that is mechanical distortion. Mechanical distortion may also take place when the piston is heated, even when one part is hot and another part cold. When the bearing faces expand against the cylinder walls, if the bearing is restricted in a lateral plane on the piston that cylinder wall pressure is available to mechanically distort the piston. If there is relief, as implied in the fact that the bearing is not complete, then mechanical distortion can be utilized to compensate for extra expansion of the piston. The thermal distortion is that obtaining in the Mooers construction, for example. In such a piston the head can be heated even when the piston is not mounted in the cylinder. The heating of the head will cause the head to expand, it will cause the heat to flow to the skirt, vertically through the connectors shown in the Mooers construction; it will expand the skirt as the result of temperature alone, but it will expand the skirt an additional amount because of the greater expansion of the head as

compared with the skirt. Such expansion of the top of the skirt is due entirely to differences in temperature, as opposed to the application of mechanical force or load. When the portions at the top of the skirt which are the hottest and which bear the mechanical connection to the head, expand to a greater extent than other portions of the skirt, the piston distorts. In this case the skirt portions removed from the vertical connectors draw in, and in that manner may be utilized to help compensate for the extra expansion at the top of the skirt.

Q. You said that at the time you made this test you were preparing the Simmons case. You knew what particular device was involved in this Simmons case, didn't you, the particular piston? A. Yes.

Q. It was exactly like Exhibit 1, wasn't it? A. It was quite similar, at any rate, to Plaintiffs' Exhibit 1.

Q. Well, you don't know of any distinction, except possibly in size, do you? A. One of the infringing devices was, I think, just the same as Plaintiffs' Exhibit 1, and as I recall it also another piston was the Plymouth four-cylinder piston. I don't recall whether the Ray-Day was in the Simmons suit or not.

Q. You mean by the Plymouth this like Exhibit 3-O? A. No, that is the Plymouth Six. I had reference to the Plymouth Four. It was quite similar to the Ford Four.

Q. Well, did that exhibit in the Simmons case that you said corresponded to Exhibit 1, did that have the general structure of the Maynard patent? A. Yes.

Q. It had these cross webs or cross pieces on which the wrist pin bosses are mounted, like in Exhibit 1; is that right? A. Yes.

Q. You don't remember any distinction over that? A. No, I don't remember any.

Mr. Richey: I think I can clear up some of the facts about the situation. The decree entered in the Simmons suit was a consent decree. The accounting has not been concluded, nothing has been collected on the Franquist patent and we don't propose to collect anything on the Franquist patent. Since we learned of the tests the Doctor made, we have not included the Franquist patent in any of these piston suits. That is correct, isn't it?

Mr. McCoy: That is correct. We withdrew the Franquist patent in the suit against the Lawrence-Ohio Company immediately upon learning of the results of Dr. Jeffries' tests on that Franquist piston.

And counsel were so informed that we had withdrawn that, that is, counsel for Lawrence-Ohio Company.

Mr. Bruninga: What date was that, was it before or after the expiration of the Franquist patent?

Mr. McCoy: It was before the expiration of the Franquist patent.

Mr. Richey: We don't mean by these statements that the Franquist patent didn't possess some validity as to some of its particular features, even though it doesn't possess flexibility.

Mr. Bruninga: That is all.

RE-DIRECT EXAMINATION by Mr. Richey.

Q. These tests you made of the Franquist piston in 1931 that you described, were those exhaustive for the particular purpose you made of them, in your opinion? A. Were those exhaustive, you say?

Q. Yes. A. No.

Q. Were they sufficient to demonstrate the question of flexibility that you were working on? A. To my mind, yes.

Q. Are they comparable with the tests that you made on pistons to determine their flexibility? A. They are exactly comparable with other tests which I made at the time on other pistons. The test itself, so far as I know, is not a criterion in the testing of a piston in use. The criterion is the motor test, that is, the test in operation within a cylinder under power.

Q. Would you expect those pistons to operate any differently in a motor than they were demonstrated by you with the experiments that you used? A. No, not with respect to circumferential flexibility.

Q. If you tested in a motor how can you determine their circumferential flexibility any better than you did if you didn't? A. I couldn't determine it any more positively to my mind, but one could mount the piston in a cylinder and find exactly what clearance is required in order to develop maximum power under hot motor conditions, and that clearance contrasted with the clearance of a trunk type piston under the same conditions should give a fair idea of the flexibility.

Q. Well, Doctor, why didn't you continue your tests and put them in a motor? A. Well, the Simmons suit was settled and I had a lot of other work to do at the time. I didn't do any more testing of these pistons after that.

Q. You were asked again regarding this Spillman & Mooers patent 1,092,870. You have read that patent over, haven't you? A. Yes.

Q. Do you find anything in there that justifies the splitting of the skirt longitudinally as shown in this Exhibit 3-P? A. No.

Q. Will you state whether or not the splitting of the skirt longitudinally as shown in Exhibit 3-P over the disclosure in the patent, affects the mode of operation and the results of the piston? A. Yes, it does.

Q. In what way? A. It makes a live piston out of a dead one, insofar as compensation for excessive expansion is concerned. It happens in that piston to produce a high degree of flexibility at the top of the skirt and a low degree at the bottom of the skirt.

Q. Would the piston even when split as in Exhibit 3-P, be a commercial piston, in your opinion? A. No.

Q. And why not? A. It is too heavy and too expensive to make.

Q. Now, these holes shown in the bosses in the Gulick patent, do you know whether they are oil holes or holes for set screws? A. Well, I can't say from the drawing, but there is no statement to the effect that they are one or the other, so far as I know.

Q. I call your attention to Fig. 1 and to the fact that there is a hole in the bottom of the boss, another hole in the top that leads to the point 22. Does that help you to determine whether that is an oil hole or is a set screw hole? A. Well, it is certain that the hole at the bottom of the boss would be put in in order to make possible the drilling of the hole at the top of the boss, so that it would be necessary to put holes through the boss in order to get the oil holes in in that construction.

Q. In other words, the holes at the top, marked 23, transmit the oil from spout 23 to the bearings? A. Yes.

Q. And then what would the holes in the bottom boss be for? A. Well, it could be an oil drain. In fact, it must, as I see it now, it must be an oil drain. And the fact that the boss is provided with oiling means, means that it is not locked in the bosses, otherwise there would be no necessity for oiling the boss bearings.

Q. Now, when you said that a piston could be made flexible at the bottom by a single slot, you were referring to the deposition Exhibit B? A. Yes.

Q. You said that this Exhibit 3-T corresponded substantially to the drawings of the Gulick patent. What

views of the Gulick patent did you mean when you said that? A. Figs. 1 and 2.

Q. Now, when you said yesterday that the Jardine was the first solution of the slapping and sticking piston problem, and Maynard was the second that you knew of, to what time were you referring? A. 1919-1920, approximately.

Q. At that time you hadn't learned of the Gulick type? A. No.

Q. Now, have you read the Ricardo article in this Exhibit 3-S, concerning which you were asked yesterday? A. Yes.

Q. Now, as a result of your testing the Ricardo piston, what would you say as to the language of that article in general? A. I would say that the article makes statements which are wrong and particularly extravagant with reference to the claims of the Ricardo piston, and perhaps misleading as to the value of the so-called crosshead type of piston referred to in the later part of the article.

Q. Take the statement appearing down near the bottom of the third column of page 274, which is as follows: "Experience has shown that with these divided slippers the clearance necessary can be reduced to about one-half of that required for the ordinary type, and to little, if any, more than is required for a cast iron piston." Did you find from your test with this Ricardo piston that the statements made therein are correct or not? A. They are wrong.

Q. Were the British engineers representing Mr. Ricardo present at the tests where you found that was wrong? A. Yes.

Q. Were they able to make those Ricardo pistons operate, as stated there? A. No.

Q. Have you now named all of the schemes that were tried out at the Aluminum Castings Company prior to the invention of the Jardine patent in suit in an effort to solve the problem that was solved by Jardine? A. No.

Q. Will you name any other schemes that were tried out to try to whip that problem at that time? A. Another way in which the problem was approached was to try to find a cylinder material which had approximately the same coefficient of thermal expansion as the aluminum alloy piston. To this end a motor was equipped with aluminum alloy sleeves or cylinder walls with the

same chemical composition as the piston itself, and the test was made to determine whether or not such a combination would be feasible. Although the combination worked for a time, before the test was completed the cylinder walls as well as the pistons, became sufficiently scored so that the plan was given up. I happened to have directed that test myself.

Another method used was to try to avoid the scoring by hardening the inside wall of the cylinder in some way. Electro-plating of the inside of the cylinder with iron was the means tried, and whereas this produced the desired result from the standpoint of co-efficient of expansion, and whereas some of the laboratory tests looked quite promising, it was also given up partly because of the chipping of the iron plating in places in some of the cylinder barrels, and also partly because the Jardine and Maynard solutions had come along in the meantime. It was also suggested as a means of overcoming this difficulty by C. Harold Wills, as I recall it, that the head of the piston could be plated with some bright metal which would reflect the heat from the explosion and the piston head would thereby be kept quite cool and the piston would not expand so much by virtue of its temperature. These plating ideas started during the war on the Liberty engine piston, but Mr. Wills still had the thing in mind and proposed it as a means of overcoming this difficulty, after the war was over.

Q. That was Wills of the Wills-St. Claire Company, wasn't it? A. Yes, formerly with the Ford.

Q. Have you named all you can think of? A. I don't recall any more schemes at the present time.

Q. You said something about the cross-head piston shown in this Ricardo article, Exhibit 3-S. Will you state whether or not any effort was made to employ that kind of scheme? A. Yes, the piston described in the Ricardo article at the end of the article was also represented to us by the Ricardo engineers as something having advantage, and the Aluminum Manufactures, Incorporated, actually designed and built a complete motor for the purpose of testing out that piston. It is not a conventional type of piston for internal combustion engines, hence a new motor had to be designed and built. The piston is long and heavy and is supposed to have its main bearing surface far removed from the head so that it can be kept cool during operation and the highly heated end is supposed to operate in another cylinder

higher up in the motor. That piston was tried out in this special motor and the motor was even put in the car and a road test was made and the piston and motor combination proved to be unsuccessful.

Q. Now, you spoke of the trial of the double-walled aluminum integral piston designed in an effort to keep the skirt walls cool and thus avoid expansion. Can you produce such a piston? A. I have such a piston in my hand.

Mr. Richey: I offer that piston in evidence as Plaintiffs' Exhibit 24.

Q. When was that piston tried out? A. I think about 1917.

Q. And by whom? A. The Aluminum Castings Company.

Q. Now, what was the result of the efforts of the trials of that piston? A. The piston couldn't be fitted as closely as was required and it was difficult to get a bearing of the skirt sufficiently rigid to keep the head sections from moving back and forth during the piston operation. This skirt is shown turned over to a point only slightly below the bottom of the boss. Pistons of this type, however, were made in which the skirt section was spun up practically to the ring groove section. Even such pistons did not function properly in the motor.

Q. You were asked about this piston, Exhibit B of the depositions: in your opinion, is that a commercial piston? A. No, that is not a commercial piston at the present time.

Q. And why not? A. Because it does not have the means for compensating for extra expansion at and near the top of the skirt.

Q. Will you state whether or not in your opinion that piston embodies the structure, mode of operation and results of any of the patents in suit? A. For practical purposes it has not.

Q. Well, does it for any purposes? A. Well, I had in mind that the flexing of the bottom of the skirt in this piston, deposition Exhibit B, is present and in so far as it takes place or would take place in this piston and would take place in the pistons of the patent in suit, there might be some similarity there.

Q. Well, you mean that one feature alone?

Mr. Brumingа: I object to that as leading.

A. That is it.

The Master: He has answered.

Q. Considering the patents in suit as a combination of elements operating to get a result, state whether or not you find any of those combinations in this Exhibit B? A. No.

Q. Now, you were asked about this Hartog patent, 1,842,022. State whether or not that piston has ever been used commercially to your knowledge. A. No, it has not, in my opinion.

Q. Is it, in your opinion, a commercially practical piston? A. No, I think it is not.

Q. Will you give your reasons for so saying? A. I think this Hartog piston is, among other things, entirely too flexible. It is designed to be put into a cylinder of smaller diameter than the skirt diameter itself, and the wrist pin supports in my opinion would be inadequate because the piston would be thrown from one side of the cylinder to the other by virtue of the high flexibility of the skirt. The piston has no rings and consequently it would not function properly from the standpoint of oil consumption, in my opinion.

Q. You were asked about this Exhibit 22, and particularly about the inclined relief shown at H. Can you tell from the drawing when that inclined relief was placed on the drawing? A. Yes, it was put on, according to the data on the drawing itself, on the 21st of February, 1925, and the item refers to "Their wire 2-19-25."

Q. And when was the drawing dated? A. The drawing is dated 9-1-23.

Q. Now, you testified that the pistons of Ricardo and Pomeroy patents were made in permanent molds with certain special inserts. Will you state whether or not that particular scheme you employed was commercial or whether you used it just for making experimental pistons? A. We used it at the insistence of the Ricardo representatives that the piston construction should be as nearly as possible that described by Ricardo, especially with respect to the location of the boss-supporting webs. The pistons so made up were merely samples and were never put in production.

Q. During your cross examination you were asked to and made a comparison of the Jardine and Ricardo pistons, in which you mentioned only the flexing of the skirt. Will you make a full comparison of these pistons

in structure, mode of operation, and results? A. The Ricardo construction shown in the Ricardo patent 1,294,833 is intended to be operated as a non-flexing device, both as regards the skirt and the webs. The proportioning of the web sections and skirt sections, and the location of such sections in Jardine, co-operate with the horizontal and vertical slots to produce flexibility and compensation for excessive expansion both by flexing of the webs and flexing of the skirt. When the Jardine construction is heated, the boss portion will be expanded more than the portion at right angles to the bosses. Such expansion will tend to bring the edges of the skirt sections outward and would produce scoring if it were not for the flexibility of the webs and the vertical slots making possible the flexing of the webs to relieve this excess pressure. There is no possibility of such compensation in the Ricardo construction because of the rigidity of said construction and because of the absence of the vertical slots. The Ricardo construction is therefore not made to compensate for this extra clearance, whereas the Jardine construction is. In other words, the proportion of the sections in Jardine and the proper location of the sections co-operating with the horizontal and vertical slots, puts flexing life into the piston of Jardine which is absent in Ricardo. The modes of operation are therefore different, and the results are different.

Mr. Richey: That is all.

Re-Cross Examination by Mr. Bruninga.

Q. Just a few questions: you have not brought along any samples of the Jardine and Ricardo pistons, have you? A. No, I have not had an opportunity even to get over to my office during the recess.

Q. Now, I believe you stated that the separation of the head from the skirt in Moores patent, together with the reliefs in the regions of the wrist pin bosses, enabled Moores to reduce the clearance; is that right? A. Yes.

Q. You would expect that Mr. Ricardo to do the same thing, wouldn't you? A. No, it doesn't so operate. He has ample relief around the bosses, but he doesn't have it where it is most needed. As I compare the two constructions, the Ricardo relief does not extend around the connectors. The Ricardo relief only extends part way between the ends of these connectors.

Q. You mean the relief in the region of the wrist pin bosses? A. The relief around the junction of the connectors with the skirt portion. Of course also the Ricardo piston has the webs extending directly from the head rather than from the ring flange portions.

Q. And you think that makes the difference, whether you extend that from the head or from the ring flange? A. Well, that is a difference in the specific construction; but the reason I say Ricardo does not compensate for the extra expansion by relief, is that the extra expansion is greatest where the webs join the skirt section, and the effective skirt relief is on the boss, outer-end direction from such connections.

Q. What do you mean,—the connections are too wide? A. I mean that the webs of Ricardo are so long and so proportioned with reference to the diameter of the cylinders, and so related to the bearing area of the skirt that their expansion tends merely to push the skirt opposite the webs more tightly against the cylinder wall.

Q. And that would not happen in Maynard? A. That would happen in Maynard to an extent, but Maynard has flexibility.

Q. Flexibility between the wrist pin bosses and the skirt section? A. Yes, and also some web flexibility at the top of the skirt.

Q. Some web flexibility at the top of the skirt? A. Yes.

Q. More web flexibility than Mr. Ricardo? A. Well, Ricardo has no web flexibility, because he has no place for the web to flex. He has the rigid, non-flexible structure, whereas Maynard has a flexing structure.

Q. Even a flexing structure at the top of the web? A. Yes.

Q. Even though it is connected along an entire chord; is that your idea? A. Yes, I consider that that is a flexing structure, and a flexing feature on Exhibit 1 and also on the side of the Maynard piston, taking the maximum thrust, that is, opposite the side where the vertical slot is placed there is compensation for extra expansion by means of the Moore's principle.

Q. But the length of the webs, the length of these webs C of Ricardo, is about comparable to the length of the web in Exhibit 1 or 17? A. I should say the length is somewhat more in the Ricardo construction, because the webs are disposed in the Ricardo construction in

such a manner as to hold the entire wrist pin very substantially within the outer diameter of the piston.

Q. Well, you say the connection of the webs C' to the piston is comparable with the length of the connection in Exhibits 1 and 17? A. I should say the Ricardo web was somewhat longer.

Q. It is considerably shorter compared with the diameter of the piston, isn't it? A. The web?

Q. Yes. A. I think not.

Q. The connection of the webs at these points where they join the piston? A. I should say at that point they are fairly comparable.

Q. Now, the use of an aluminum sleeve and an aluminum piston is about comparable to a steel skirt piston with a cast iron cylinder, isn't it? That is, both have substantially the same co-efficient of expansion? A. Yes.

Q. And you don't know whether any steel skirt pistons are actually on the market today, steel skirt and aluminum head? A. Oh, no, no such pistons are on the market, at least not within my knowledge.

Q. Not even for replacement purposes? A. Not so far as I know.

Q. Now, you called attention to the electroplating of cylinders. That was copper-plating, wasn't it, of the inside of the cylinders? A. No, that was iron plating.

Q. Iron plating of the inside of the cylinders? A. Yes.

Q. Plating the inside of the iron cylinder with iron? A. No; plating the inside of an aluminum alloy cylinder with iron.

Q. You know the General Motors plates the cast iron pistons with copper and then with tin, don't you? A. Well, I didn't know they plated them with copper. I believe that the outside coating, at any rate, is tin.

Q. And General Motors still uses cast iron in all of its pleasure cars? A. Yes.

Q. So they are still working on the problem today, aren't they? A. Yes.

Q. The problem of using something else but aluminum pistons? A. No; they are working on the whole motor problem; pistons and everything else, and trying to make all things either as cheaply as they can or as good as they can and generally speaking to get the best results for a given amount of money.

Q. But General Motors is still working on this problem of keeping away from aluminum pistons? A. Well,

I don't know that they are working on the problem of keeping away from aluminum pistons. They aren't using aluminum pistons in their pleasure cars at the present time, and I presume they are doing work on pistons.

Q. That plating of a cast iron piston was a rather recent development, wasn't it? A. I don't know when it was developed.

Q. Well, it was since the Maynard patent came into use, wasn't it? A. The commercial application of it certainly was, so far as I know.

Q. You said the Hartog patent is entirely too flexible. You then can make the webs and the skirt too flexible, can you? A. Yes.

Q. You make it a particular point that Hartog has no piston rings at the top and therefore that is one of the disadvantages of the piston? A. Oh, I should think the piston would be inoperable from that standpoint alone, if from no other.

Q. Now, Exhibit 22, as you read, bears the notation "Their wire." Do you know what that wire refers to? A. Why, I imagine it refers to a wire from Willys-Overland Company to change the blue-print in a certain manner.

Q. It was a hurry-up call, wasn't it?

Mr. Richey: I object. He doesn't know; he is just imagining.

Mr. Bruninga: Well, he can only state if he doesn't know.

A. I think not. Those messages are frequently sent by wire or even long distance 'phone.

Mr. Bruninga: That is all.

Mr. Richey: That is all.

(Thereupon adjournment was taken to 9:30 a. m. of the following day.)

(At 9:30 a.m., Wednesday, January 25, 1933, the hearing was resumed. Harold H. Burton also appearing for the plaintiffs.)

Mr. Richey: I would like it to appear on the record that there were involved in the Simmons suit eight patents, of which the Franquist was one, and all eight were admitted to be valid and infringed in the consent decree.

The Master: When was that decree entered?

Mr. Richey: That decree was entered September 25, 1931.

Of the patents in suit pending now before this master, there were in the Simmons suit the Schmiedeknecht patent, the Mooers, the Maynard, the Jardine and the Gulick patents, that is, all of the patents in the suits now at bar were in the Simmons suit.

Mr. Bruninga: And in addition to that the Spillman & Mooers patent 1,092,870 and the Franquist patent 1,153,902, and the Howdeshell reissue patent 16,273.

Mr. Richey: I think perhaps it would be helpful if I offered in evidence a copy of the consent decree in the Simmons case, which I now do as Plaintiffs' Exhibit 25.

Thereupon the Plaintiff called as a witness A. J. Perfler, who, being first duly sworn, testified as follows:

Direct Examination by Mr. Burton.

My name is A. J. Perfler, and I am Assistant Trust Officer of The Cleveland Trust Company, in Cleveland, Ohio. As Assistant Trust Officer of The Cleveland Trust Company my duties have to do with the administration of corporate trust estates, particularly patent estates. I am familiar with all the trusteeships of patents that are administered by The Cleveland Trust Company. There is but one trusteeship relating to automobile pistons held by The Cleveland Trust Company; it is called the L. P. Mooers piston patent estate and was created on March 7, 1922.

I am familiar with the relation of The Cleveland Trust Company to the patents in suit, identified as follows: Gulick patent 1,815,733; Jardine patent 1,763,523; Maynard patent 1,655,968; Schmiedeknecht patent 1,256,265; Mooers patent 1,402,399. These patents are included in the Mooers patent trusteeship administered by The Cleveland Trust Company. The Cleveland Trust Company has no other relation to the patents in suit except through its ownership of them under this trusteeship.

Plaintiffs' Exhibit 26 is the original signed Conveyance, Declaration of Trust and Agreement between L. P. Mooers and George Pitts, and The Cleveland Trust Com-

pany, dated March 7, 1922. That instrument, dated March 7, 1922, is now in effect and it sets forth the entire terms of the trusteeship under which The Cleveland Trust Company holds title to these patents in suit.

Mr. Burton: I offer this instrument in evidence as Plaintiffs' Exhibit 26, and request the privilege of withdrawing the original and substituting a printed copy.

The Master: It may be so received.

(Narrative continued) Additional patents have been acquired by The Cleveland Trust Company and placed under that trust in the following manner: One by purchase. My recollection is they have purchased eight or nine patents outright. Another is by assignment; some of them from the Aluminum Company of America, some from Bohn Aluminum & Brass Corporation, and some from H. J. Hater, of Cincinnati, of Aluminum Industries, Inc.

The trust agreement recites the patents included in the trust estate, at its inception, and then provides for the acquisition of the patents as after-acquired property.

Provision D-5 in the trust agreement, reads:

"Subject to the conditions and provisions hereinafter set forth, the trustee shall be and is hereby authorized and empowered as follows: 5. To acquire, and receive the title to and licenses under inventions of improvements, applications for Letters Patent, and Letters Patent which upon their acquisition shall be included within the term 'property' as used herein."

There is no identification placed upon the patents when they have been acquired pursuant to that provision or others in that trust instrument; the patents acquired are not earmarked in any way at all; they are simply taken by us and become part of the property which comprises the estate. They are assigned to The Cleveland Trust Company and then if they are intended to come within the trust instrument, are placed with those that are kept under the instrument. The only thing I have to do with the identification of those patents which are assigned to The Cleveland Trust Company and placed under this trust instrument, is to list them. I am familiar with all of the patents that have been acquired by The Cleveland Trust Company and placed under this trust instrument.

No such subsequently acquired property that is placed under the trust instrument is held under any different terms of ownership or control than the original property.

Mr. Bruninga: I would like to know if there is a writing on that; something in writing; an additional agreement, before the witness answers the question.

Mr. Burton: The witness has already answered that that instrument contains all the terms that now control the trusteeship.

Mr. Bruninga: I have let you go ahead and let him tell you what is in that instrument. I would like to have the witness say whether there is any other agreement. It seems to me from these other contracts that there is a supplemental agreement dated April 26, 1924, as specified both in Exhibits 4-D and 5-D.

Mr. Burton: I thought I covered that. I don't know what that is.

(Narrative continued) There is no supplemental agreement to this trust agreement that I know of.

Without critically examining Plaintiffs' Exhibits 2 and 2-B, I know that this is the assignment from Packard Motor Car Company of the Gulick patent, and this is the original Gulick patent. Exhibit 2-B is the assignment from the Packard Motor Car Company to the Cleveland Trust Company of the Gulick application. That represents the only assignment that has been made of that patent to The Cleveland Trust Company.

Exhibit 3-D, attached to Plaintiffs' Exhibit 3, is the assignment from the Aluminum Company of America to The Cleveland Trust Company of the Jardine patent, and this is the original Letters Patent. The assignment from the Aluminum Company covered the applications for patents issued. That is assigned to The Cleveland Trust Company as trustee with directions to issue the patent to The Cleveland Trust Company as trustee.

The provision in Exhibit 3-D stating that the conveyance was to The Cleveland Trust Company as trustee under the said conveyance, declaration of trust, and agreement dated March 7, 1922, is the only assignment of this patent to The Cleveland Trust Company.

Plaintiffs' Exhibit 4-D, attached to Exhibit 4, is an assignment of the Aluminum Company of America's interest in the Maynard patent to The Cleveland Trust

Company as trustee, and this is the original Maynard patent that was issued.

It doesn't so state in the assignment of The Aluminum Company of America, but it states in the recitation clause that the Aluminum Company of America has had assigned to it one-half of the right, title and interest in the Maynard patent, and that is the interest which they conveyed to us by that assignment. That assignment, known as Exhibit 4-D, is the only assignment of the interest of the Aluminum Company of America under this trust to The Cleveland Trust Company.

Exhibit 5-D, attached to Plaintiffs' Exhibit 5, is an assignment of the Schmiedeknecht patent from Bohn Aluminum & Brass Corporation of Detroit to The Cleveland Trust Company and this is the original Letters Patent covering the Schmiedeknecht patent. The provision in the instrument of assignment, Exhibit 5-D, stating that the assignor does hereby sell, assign, and set over to The Cleveland Trust Company the whole right, title, and interest in and to said Letters Patent, is the only instrument of assignment by which The Cleveland Trust Company holds title to this patent. This patent is administered by me as a part of the Moocrs patent trust that I referred to.

Exhibits 6-B and 6-C, attached to Plaintiffs' Exhibit 6, are two assignments: one from George B. Pitts to The Cleveland Trust Company of an undivided one-half interest (referring to Defendants' Exhibit 6-C); and the other of Louis P. Moocrs, of an undivided one-half interest to The Cleveland Trust Company in patent 1,402,309, covering pistons (referring to Defendants' Exhibit 6-B). There are no other assignments under which The Cleveland Trust Company claims title to the Moocrs patent than those I have just examined.

The trust estate does not own any patents relating to molding or molding machinery relating to pistons. If I may be permitted to go back to that point as to from whom we had acquired patents, I failed to include the Packard Motor Car Company, in listing those from whom we had acquired patents in suit. I wish to list the Packard Motor Car Company.

Mr. Burton: That is all.

Cross Examination by Mr. Bruninga.

The trust estate holds no molding machine patents or molding patents; it simply holds piston design patents per se. The reason for that limitation is that is the nature of the estate; does not include anything else.

Exhibits 3-D and 4-D each mention a supplemental agreement dated April 26, 1924, and 4-D provides:

> "The patent rights transferred hereunder are included by the Cleveland Trust Company in a certain license agreement dated April 26, 1924, wherein The Cleveland Trust grants *inter alia* a non-exclusive license to Aluminum Company of America under certain patents and applications, and the assignment made herein is made subject to the right of re-assignment under the terms and conditions provided in a certain so-called 'supplemental agreement' dated April 26, 1924 between The Cleveland Trust Company and Aluminum Company of America, and a letter of October 12, 1927, from the Aluminum Company of America to the Cleveland Trust Company."

That supplemental agreement dated April 26, 1924 is a supplement to the license agreement to Aluminum Company of America; it has nothing to do with the trust estate agreement.

Q. Well, that is your opinion. I would like to have it produced anyway.

Mr. Burton: You ask to have that produced along with the others for your examination and the master's examination to see whether they are material.

Mr. Bruninga: And the same with the letter of October 12, 1927, from Aluminum Company of America to The Cleveland Trust Company, and if there are two letters and two supplemental agreements on that date, one relating to each agreement, I would like to have those produced also. And of course also the particular license of April 26, 1924 mentioned in each agreement.

(Narrative continued) In addition to the agreements mentioned, that are listed in Exhibits 3-D and 4-D, that relate to the Maynard or Jardine patents, there is a Bohn license. There are no other agreements between The Cleveland Trust Company and Aluminum Company of America.

All the patent titles came to us by assignment. I said some were purchased. I did not intend to make any distinction between the patents that were purchased and the ones that were obtained by assignment, except this: that those patents that were in the estate at the inception weren't purchased. We purchased only those subsequently acquired after the trust estate was created.

The Mooers, Schmiedeknecht and Gulick patents are assigned directly to The Cleveland Trust Company, while the Jardine and Maynard patents (referring only to one-half interest in the Maynard patent) is to The Cleveland Trust Company, trustee. I know there is no distinction; the titles are both held for the same purpose and for the same end, in the same way.

The Cleveland Trust Company owns eighty patents in this estate, and twenty-three applications. There is a list here of those eighty patents, and I can produce it.

Q. I am not asking for the applications.

Mr. Burton: This again, I think, is clearly going into that field of bringing this trusteeship of The Cleveland Trust Company in here far beyond anything that relates to the case; it is perfectly immaterial whether they granted ten other licenses or fifteen other licenses, as far as affecting its title, which is the question to which the witness testified.

Mr. Richey: I object to the question as immaterial. The only question this Court is concerned with as far as title to these patents is concerned, is as to those in suit.

The Master: How is it material?

Mr. Bruninga: Your Honor will notice there has been talk about our infringing an additional patent, and this witness is not placed on the witness stand as an officer, and there certainly is no harm in giving us a list of patents that The Cleveland Trust Company owns. Furthermore he volunteered they owned eight or nine patents by outright purchase. He brought the matter up himself, and seems to make some point about that.

Mr. Richey: As far as that additional Franquist patent is concerned, we have told you that The Cleveland Trust Company owns that. If the rule was that evidence should be let in just because counsel see no harm to it, there is no end to our case.

(Further argument had by counsel.)

The Master: I think I will ask counsel for plaintiffs to permit Mr. Bruninga to examine this list before I let it in, to see whether there is anything pertinent to this suit. If it is pertinent to this suit, perhaps it is admissible, but I don't want it to go to a great extent.

Mr. Richey: We submit the list to opposing counsel.

Mr. Bruninga: I would like to look at this in connection with the licenses. I don't want to bring in anything that is not material at all.

(Short recess taken.)

Mr. Bruninga: Now, this Plaintiffs' Exhibit 3-C offered in connection with the Jardine patent refers on page 4 to licenses to Walker M. Levett, copies of which are attached to and marked Exhibits II (5) and II (6). I ask for the production of those licenses under the same conditions as the others. Then page 5 refers to an outstanding license to National Piston Company a copy of which is attached hereto and marked III (1) and which is not attached, and I ask for the production of that license. Pages 5 and 6 refer to an outstanding transferable non-exclusive license to the Kant Skore Piston Company, stated to be marked Exhibit IV (1), a copy of which is stated as being attached to the agreement, and I ask for the production of that. Page 11 refers to a list dated July 1, 1922, and which provides for re-assignment of the patents enumerated, including the Jardine patent in suit. I ask for the production of that list. The licenses are of course on the question of public acquiescence. The last refers to the question of title.

I may say, your Honor, on the question of title that while there may be an outright assignment, there may be a supplemental agreement which absolutely affects the assignment. There was a recent case in the 50 F. (2d) that passes on that very question (Six Wheel Corp'n. v. Sterling Motor Company). (Further remarks made by counsel.)

The Master: It is understood they will be produced under the same conditions.

Mr. Bruninga: That is all.

Re-Cross Examination by Mr. Bruninga.

The Gulick patent was an acquisition by assignment. If that is the distinction that you are making, whether we parted with any money for the patent. We paid no money for the patent—no money out of the estate for the patent. The patent was given to The Cleveland Trust Company for value received. Packard had an interest in the estate. Packard owned 600 shares of the estate out of 4512½.

I will just list the names of the beneficiaries of the estate:

Bohn Aluminum & Brass Company, 1100 shares;
Aluminum Company of America, 1100 shares;
Packard Motor Car Company, 600 shares;
E. R. Alexander, 350 shares;
H. J. Hater, 50 shares;
Adolph Nelson, 712½ shares;
L. P. Mooers, 600 shares.

I understand Mr. Nelson owns patents on strut pistons; I couldn't identify the patent or piston. Mr. Mooers is the Mooers of the patent in suit 1,402,809. Mr. Alexander is one of the directors of The Cleveland Trust Company. Mr. Hater is treasurer of Aluminum Industries, Incorporated, which company is a piston manufacturer and a sub-licensee under the patents in suit.

Mr. Bruninga: That is all.

Mr. Richey: I think we are through. What do you want to do about producing these documents? Do you want us to keep our prima facie open until you look them over?

Mr. Bruninga: Well, I want to call him back for cross-examination after I have looked them over.

(Thereupon noon recess taken.)

(At 1:30 p.m. Wednesday, January 25, 1933 the hearing was resumed.)

Mr. Richey: Plaintiffs rest.

Mr. Bruninga: Your Honor, we would like to proceed with the reading of the depositions in this case. I think it would be well to read them to connect up with the rest of the matter.

Mr. Richey: I think the matter should be noted that the Gulick application was filed November 30, 1917, and the Jardine March 11, 1920. Also a question on that final application I object to as not set up in the answer. Sections 40 and 41 are on the general issue which makes the application only competent on the question of invention and not on the question of anticipation. And you perhaps also would be interested in knowing that this controversy on prior art between Gulick and Long was fought out in the Patent Office and decided in favor of Gulick. We have here the Patent Office record which we will mark for identification and will come in later.

Mr. Bruninga: This whole matter of objection relates to what is to be done with the evidence rather than its admissibility; your Honor understands that.

The Master: I understand that it is all here, you have taken it, and I will pass on the question of its admissibility when I dispose of the case.

Mr. Richey: I just thought that perhaps that would make the evidence more intelligible to you.

Mr. Bruninga: It don't go to admissibility, but its application in this case.

(At this point the depositions of Venner, Chadwick, Sartor, and Gilbert, Record pages 343 to 432, were read, and the testimony of Monckmeier, Record pages 292 to 313, Herbert & George Ellingham, Record pages 314 to 328, was taken.)

(9:30 a.m., Saturday, January 28, 1933, hearing resumed. Messrs. Richey, Watts and Burton appearing for plaintiffs; same appearances as last noted for the defendants.)

(Trust Estate contracts, licenses and agreements requested of witness produced for examination of the Master and Defendants' counsel, and discussion had between counsel as to admissibility of contracts and licenses.)

Mr. Burton: In response to request of counsel, we are glad to place these in the hands of the Court, and the Court I understand extends them to counsel for defendants, but not to put them to any inconvenience, examining them here, they can take them along with them. We would like to have the Court

make it clear these are at this point confidential documents, and counsel will not make photostats or copies of them, but they are to examine them at this time for the purpose of seeing what is in there.

The Master: That is the understanding; there is to be no copies made at this time, or they are to make no copies; it is just for examination only.

Mr. Bruninga: We may, however, reserve the right to make copies later.

The Master: That question will come before the Court later, but during this examination there are to be no copies made.

Mr. Sutherland: That is correct.

The Master: At this stage of the proceeding.

Mr. Bruninga: Does that mean we can make notations and hand them over to the Court?

The Master: Certainly.

Mr. Richey: And hand them back with the copies?

The Master: That is as I understand it. I think counsel understand the situation on both sides. These are strictly confidential papers at this time and are not being admitted in evidence, simply being examined by counsel.

Mr. Bruninga: Yes.

The Master: It is understood you can take these over Sunday.

Thereupon, A. J. Perfler, being recalled, further testified as follows:

Re-Direct Examination by Mr. Burton.

I remember on cross examination, when I was last on the stand, I stated that one of the beneficiaries under the piston trust agreement was E. R. Alexander, and in response to a question by counsel for defendants, I stated he was a director of The Cleveland Trust Company. I would like to correct the impression as to the ownership of that stock; it is not stock but shares in beneficial interest. He doesn't have it as a director of The Cleveland Trust Company, and he does not hold it in any way for The Cleveland Trust Company.

Re-Cross Examination by Mr. Bruninga.

Mr. Alexander holds those shares for himself. That is also true of Mr. Mooers. Both Mr. Alexander and Mr. Mooers personally draw the dividends on that stock. I wouldn't call them dividends; it is not stock. Returns on the beneficial interest have been declared, and they have been distributed to the various beneficiaries, including Mr. Alexander, Mr. Mooers, Bohn Aluminum & Brass Corporation, and all the other beneficiaries.

There is only one licensee besides Bohn, the Aluminum Company of America.

Those returns are declared quarterly, after setting up of a suitable reserve fund. It is not a declaration of dividends, you understand, it is a distribution of returns, to the various beneficiaries.

If you wish, you can say that the licensees, such as Bohn Company and Aluminum Company of America, get back some of the royalties they have paid; it is not a return to them as a licensee; it is a return to them as a beneficiary.

Mr. Bruninga: That is all. Except of course we might, after examining these licensees, like to ask Mr. Perfler some other questions.

The Master: That is understood. He has brought them here, and as I understand he is subject to call.

In Answer to Questions by Mr. Richey.

There are but two licensees under the patents, Aluminum Company of America, and the Bohn Aluminum & Brass Corporation. The Aluminum Industries, Inc. is a sub-licensee. There are but two people licensed by The Cleveland Trust Company, and the third is a sub-licensee.

(At this point the depositions of Royalty and Stellman, Record pages 432 to 466, were read, and the testimony of Stellman, Record pages 472 to 590 and D'Vonsky, Record pages 328 to 343, was taken.)

(At 9:30 a. m., Friday, February 3, 1933, the hearing was resumed. Mr. Burton also present, in addition to counsel last noted.)

Thereupon, A. J. Perfler, being recalled, further testified as follows:

Cross Examination by Mr. Sutherland.

My name is subscribed to these various license agreements and so-called declarations of trust as Assistant Trust Officer of The Cleveland Trust Company. I didn't take part in the transactions and negotiations that were consummated in the trust agreements, and I wouldn't say that I took part in the license agreement negotiations. I am familiar with the agreements, with all the provisions.

I said that The Cleveland Trust Company had acquired eight or nine patents by purchase. (After checking patents in suit.) None of these patents here in suit were acquired by purchase. I wouldn't say that these patents or the applications filed that are here in suit were acquired by The Cleveland Trust Company in exchange for a certain number of shares in the trust estate. The Schmiedeknecht patent war acquired from Bohn, partly in exchange for a certain number of shares of the trust estate; there was an application in that exchange, as I understand the patents, only the patents are in suit. This Maynard came to us from the Aluminum Company of America. Under the license they were to assign, and the Jardine in the same manner, and the Gulick came from Packard, in exchange for a certain number of shares of the trust estate in addition to a couple of other patents.

I should say that it was the practice of The Cleveland Trust Company, in acquiring these patents for a certain number of shares in the trust estate, to transfer a number of shares more or less in accordance with the value of the patents or applications obtained.

I don't know that the Packard Company obtained 600 shares from the trust estate for the Gulick patent, the Church patent, and the Vincent patent. The Packard has 600 shares. The Gulick application was involved in part of the transaction, and also the Vincent patent. My recollection is the Church patent was also; I wouldn't say for sure. I don't know that as a matter of fact.

The Bohn Aluminum & Brass Company obtained 1512½ shares in return for the Schmiedeknecht patent and the Kent application. I don't know whether the Aluminum Company of America only obtained 1100 shares for several patents and a good many applications and an agreement to transfer every other patent relating to pistons per se that they obtained during the continuance of certain license agreements.

They obtained 1100 shares, but I don't know how they obtained them. I think that neither I, nor The Cleveland Trust Company have any other writing or record in our possession of that transaction.

The substance of the license agreement between the Aluminum Company of America and The Cleveland Trust Company is that Aluminum Company is obligated to transfer every patent relating to pistons per se that they ever obtain; during the continuance of the license agreements.

The Aluminum Company of America assigned several applications to The Cleveland Trust Company at the time the agreement was executed, and afterwards. I don't recall just how many were assigned. Included among those was the Jardine patent in suit, and subsequently a one-half interest in the Maynard patent was acquired. The Aluminum Company has 1100 shares in the trust estate.

This license agreement between The Cleveland Trust Company and the Aluminum Company of America (after examining same) covers about eight patents. They are cited in the agreement as follows: Spillman & Mooers, J. T. Vincent; H. C. Marmon; Harold D. Church; L. P. Mooers 1,347,819; L. P. Mooers 1,402,308; L. P. Mooers 1,402,309; and E. J. Gulick. Two of those patents are in suit, Gulick and Mooers.

The Mooers patent 1,402,309 and the application which later matured into the Gulick patent, are the only ones of the patents in suit named in the license agreement. The agreement covers other patents; it contemplates that the Aluminum Company of America shall assign all patents and applications covering the pistons per se; and it also contemplates that the Aluminum Company of America will be automatically licensed under any patents per se later acquired by The Cleveland Trust Company. The Cleveland Trust Company now owns about eighty patents relating to pistons, per se; and I should say that license agreement covers all of them. The point I want to make is that they are not named in the agreement. Now, this license agreement between The Cleveland Trust Company and the Aluminum Company of America is an exclusive license on everything except pistons made entirely of cast iron and steel.

Mr. Richey: I object to that. The license is the best evidence.

Mr. Sutherland: If your Honor please, I understand they don't want to put them in.

The Master: If you don't want to put the licenses in, I think he is entitled to ask that.

Mr. Richey: He doesn't know whether they are exclusive or not; whether they are exclusive or not is a matter of law.

The Master: Then the licenses will have to go in.

Mr. Richey: Then I think we will have to put the licenses in.

(Thereupon, further argument was had as to the introduction of the licenses.)

Mr. Sutherland: I will ask counsel to offer the agreement in evidence as one of plaintiffs' exhibits.

Mr. Burton: If the court please, these agreements were brought down here at the request of the defendants for their examination, if they want to put them in—we believe they are immaterial, as we have often said, but if they want to introduce that testimony for which they asked us, why, there it is.

The Master: As long as they go in evidence what difference does it make who offers them? They are here and they are exhibits. What difference does it make who designates them, if they produce them?

Mr. Sutherland: The defendants will offer them.

Mr. Burton: We note our objection on the ground that we consider them as immaterial.

Mr. Sutherland: I offer in evidence the license agreement between The Cleveland Trust Company and Aluminum Company of America as Defendants' Exhibit 4-S.

The Master: It may be received.

(Narrative continued) Defendants'. Exhibit 4-S, which I have just examined, was executed April 26, 1924.

It is correct that the Aluminum Company of America agreed in that agreement to assign to The Cleveland Trust Company all patents and all applications for patents relating to pistons per se which were thereafter acquired by it.

Defendants' Exhibit 4-T, which has been handed me, is the supplemental agreement between The Cleveland Trust Company and Aluminum Company of America, dated April 26, 1924. In paragraph 3 of this supplemental agreement, identified as Defendants' Exhibit 4-T, I find reference made to license agreements with the

Walker M. Levett Company and the W. M. Levett Corporation of New York; also the National Piston Company, Incorporated, of New York, and also the Kant Skore Piston Company of New York, and copies of these license agreements are said to be attached hereto as Exhibits E, F, and G. Exhibits E, F, and G are so attached. On the other hand, taking first Exhibit E, which is the license agreement between The Cleveland Trust Company, and the Walker M. Levett Company, it refers to a sub-license from the Aluminum Company of America to the Walker M. Levett Company said to be attached hereto and marked Exhibit B. Exhibit is not attached to this agreement. That so-called Exhibit B is not, and never was in the possession of The Cleveland Trust Company.

I signed this license agreement, Exhibit E, as assistant Trust Officer of The Cleveland Trust Company. Under paragraph 4 of that Exhibit E, which forms a part of the supplemental agreement, Defendants' Exhibit 4-T, The Cleveland Trust Company obligates itself in the event of cancellation of the so-called Exhibit B. I didn't say we didn't examine Exhibit B.

Before, when I said The Cleveland Trust Company never had Exhibit B in its possession, I didn't understand the question. Of course we examined them. I thought you said was it in our possession as a record. I can't say how long it has been since we had it; it has not been recently. I don't know where it is now.

The same thing applies to the National Piston sub-license, and also the Kant Skore sub-license.

Article 3 of the agreement dated April 26, 1924 between The Cleveland Trust Company and the Aluminum Company of America described as supplemental agreement, and provides:

"In case the license agreement is cancelled for any reason whatsoever other than because of failure of the licensee to carry out its obligations or any of them to the licensor thereunder, the licensor agrees to re-assign to the licensee all patents, patent applications, or other patent rights which have been assigned to the licensee from the licensor under said license agreement (Exhibit D) attached hereto, subject, however, to any and all licenses and sub-licenses which have been granted either by the licensor or the licensee or which the licensor is under contract to grant with respect to said patents, patent applications or other patent rights to (1) Walker M.

Levett Company and W. M. Levett Corporation of New York; (2) The National Piston Company, Incorporated, of New York; and (3) The Kant Skore Piston Company of Cincinnati, Ohio, copies of which contracts are hereto attached and marked Exhibits E, F, and G, respectively."

There are no other agreements or understandings between The Cleveland Trust Company and the Aluminum Company of America with reference to the patents in this piston trust estate, written or verbal. These two agreements, Defendants' Exhibit 4-S and the supplemental agreement, Defendants' Exhibit 4-T, represent all the features of the relation between The Cleveland Trust Company and the Aluminum Company of America with reference to this piston trust license agreement and the supplemental agreement. There are no others.

I have an executed copy of the agreement between Bohn Aluminum & Brass Company and The Cleveland Trust Co. (Witness produces same.)

Of the patents owned by The Cleveland Trust Company which I produced, I don't know whether or not The Cleveland Trust Company has any right to make, use, sell, pistons or grant licenses under those patents or any of them. The Cleveland Trust Company has granted licenses other than this license to the Aluminum Company of America under those patents. We obtained the consent of the Aluminum Company of America before granting that license to Bohn Aluminum & Brass Corporation, and it is the only one. As to whether or not The Cleveland Trust Company could grant that license until consent was had from the Aluminum Company of America, I don't know, but I know as a matter of fact that we didn't grant it until we obtained their consent.

The instrument marked for identification as Defendants' Exhibit 4-U is a license agreement from The Cleveland Trust Company to Bohn Aluminum & Brass Corporation dated as of September 15, 1927, actually executed October 12, 1927. An amendment to the license agreement dated April 25, 1928, as of January 1, 1928, was also found bound with that license agreement. I also find bound up with that a consent of Aluminum Company of America to licensing Bohn Aluminum & Brass Corporation to make, use and sell a maximum of eleven million pistons during the accounting year 1929. I find nothing else bound there with it.

Referring to the first page in that bound instrument, that is a consent of Aluminum Company of America, addressed to The Cleveland Trust Company, trustee, to execute the carrying out of agreement dated October 12, 1927 between The Cleveland Trust Company as trustee and the Bohn Aluminum & Brass Corporation.

Referring to the second page of that instrument, this is a letter addressed to The Cleveland Trust Company, trustee, by Aluminum Company of America, dated October 12, 1927, supplementing the letter of September 19, 1927. It reads:

> "We beg to say that it is understood and we hereby agree that in case we surrender the license heretofore granted to us by you under date of April 26, 1924, any reassignment of the patents, patent applications, or other patent rights which have been assigned by us to you under said license agreement, shall be made subject to the license granted by you to the Bohn Aluminum & Brass Corporation by the agreement executed this date between you and the Bohn Aluminum & Brass Corporation, the execution of which on your part we consented to in our letter of September 19, 1927."

I don't know whether Bohn wouldn't sign that license agreement until we had some sort of release from the Aluminum Company of America.

I do find bound in that instrument a letter written on the letterhead of the Aluminum Company of America. I might add that the letter I have just quoted was apparently written in Detroit, Michigan.

The substance of the letter written on the letterhead of the Aluminum Company of America is:

> "We beg to advise that we recognize that the commercial controlled type piston heretofore manufactured or for which castings have heretofore been manufactured by us are covered by claims of one or more of the patents included in this or to be attached hereto."

Controlled type pistons are those which employ the so-called strut. I want to say that is my understanding; I don't know that, of course. I don't know if Defendants' Exhibit AAA is such a piston.

There are particular patents referred to in that letter from the Aluminum Company. There are the lists attached to the letter. I don't recall whether or not the

lists A and B attached to that letter, represent every patent and patent application owned by The Cleveland Trust Company at the time that letter was written.

Q. I will ask you to compare those lists A and B with the lists A and B which are appended to the Bohn license agreement. Perhaps counsel will admit they are the same.

Mr. McCoy: Have you compared them?

Mr. Sutherland: Yes.

Mr. McCoy: They speak for themselves, then.

Mr. Richey: Subject to correction if we find any error.

(Narrative continued) I don't know whether the Bohn Aluminum & Brass Corporation would not sign this license agreement until the Aluminum Company of America admitted for all practical purposes that these so-called commercial controlled type pistons were covered by one or more patents owned by The Cleveland Trust Company.

I did not state that I took part in the negotiations which led up to these license agreements.

There is no other agreement between Bohn Aluminum & Brass Corporation and The Cleveland Trust Company, written or oral. There is no understanding between them. I do not know of any other agreement, whether written or oral, between Bohn Aluminum & Brass Corporation and the Aluminum Company of America.

Mr. Sutherland: I will ask counsel for plaintiffs to offer in evidence these agreements identified as Defendants' Exhibits 4-T and 4-U.

(After conference between counsel for plaintiffs, Mr. Burton examined the witness as follows:)

Defendants' Exhibit 4-T, which has been marked for identification, is the supplemental agreement dated April 26, 1924 between The Cleveland Trust Company and the Aluminum Company of America. I can identify this as the original instrument. The papers attached to the instrument which I have just identified are attached and referred to in the agreement as being a part of the agreement Exhibit D, which is a license agreement between The Cleveland Trust Company and Aluminum Company of America dated April 26, 1924. Those are copies of the instruments. Exhibit E, an agreement dated

April 11, 1924 between Walker M. Levett Company and W. M. Levett Corporation and Walker M. Levett and The Cleveland Trust Company; an agreement marked Exhibit F, dated April 11, 1924, between The National Piston Company, Gustave E. Franquist, James E. Diamond and the Cleveland Trust Company; an agreement marked Exhibit G, dated April 11, 1924, between the Kant-Skore Piston Company and The Cleveland Trust Company.

Mr. Burton: Plaintiffs will offer as an exhibit the instrument identified as Exhibit 4-T as Plaintiffs' Exhibit 38, and will identify for the purposes of reference that exhibit as embodying 38a, the agreement between The Cleveland Trust Company and Aluminum Company of America, and 38b the copy of the license agreement between The Cleveland Trust Company and the Aluminum Company of America; 38c, copy of license agreement between Walker M. Levett Company and W. M. Levett and The Cleveland Trust Company dated April 11, 1924.

Mr. Sutherland: I will admit that 38b is the same as Defendants' Exhibit 4-S, dated April 11, 1924.

Mr. Burton: As 38d, copy of license agreement between The National Piston Company and James A. Diamond and The Cleveland Trust Company dated April 11, 1924; as 38e, copy of license agreement between the Kant-Skore Piston Company and The Cleveland Trust Company dated April 11, 1924.

I offer those in evidence on behalf of the plaintiff with permission to substitute a copy of them.

Mr. Sutherland: A photostatic copy, provided you give us a photostat of it. The same thing applies to Defendants' Exhibit 4-S.

The Master: That is as to photostatic copies.

Mr. Burton: For the purposes of the record it had better stay like it is here, on account of their all being attached as a part thereof.

(Narrative continued) Defendants' Exhibit 4-U are the original instruments; I know that they are.

Mr. Burton: Your Honor, I offer in evidence on behalf of the plaintiff the several parts of Defendants' Exhibit 4-U, identifying them as follows: Plaintiffs' Exhibit 39a, letter from Aluminum Company of America to The Cleveland Trust Company,

dated September 9, 1927; Plaintiff's Exhibit 39b, original letter from the Aluminum Company of America to The Cleveland Trust Company, dated October 12, 1927; Plaintiffs' Exhibit 39c, original license agreement between The Cleveland Trust Company and Bohn Aluminum & Brass Corporation, dated September 15, 1927; Plaintiffs' Exhibit 39d, original letter from Aluminum Company of America to Cleveland Trust Company dated September 19, 1927, referring to commercial controlled type piston heretofore manufactured; Plaintiffs' Exhibit 39e, original letter from Aluminum Company of America to The Cleveland Trust Company, dated April 26, 1928; Plaintiffs' Exhibit 39f, original agreement between The Cleveland Trust Company, trustee, and Bohn Aluminum & Brass Corporation dated April 25, 1928, as of January 1, 1928; Plaintiffs' Exhibit 39g, original letter from the Aluminum Company of America to The Cleveland Trust Company, trustee, dated December 24, 1929, with the understanding there is authority to substitute photostatic copies for these instruments.

Mr. Sutherland: Provided we have a copy.

(Thereupon short recess taken.)

(Narrative continued—In response to questions by Mr. Sutherland.) Referring to Plaintiffs' Exhibit 39c, the license agreement, I do not know why those patents were listed separately; I wouldn't care to say without checking into the records; I wouldn't care to trust to my recollection about it. There are upwards of thirty or forty patents there, and I wouldn't care to say without checking the agreements. I am acquainted with these agreements, but I don't know why these patents were listed separately.

I testified that the Ivrdine patent here in suit was acquired from the Aluminum Company of America. The application for that patent, Serial No. 450,886, was listed in list B. The Gulick application and the Moore patent were not obtained from the Aluminum Company of America, the Gulick application being Serial No. 204,661, and they were listed in list A.

I don't know if there has been any change in the title to the patents listed in list B since this Bohn license agreement was entered into; I would be familiar with it if there were any. So far as I know, the patents listed

in list B are held in the same way today as they were on October 12, 1927; there has been no material change; there has been no change in this agreement, if that is what you mean.

If the Bohn Aluminum & Brass Company knew at the time that license agreement was entered into, how The Cleveland Trust Company held title to those patents, I don't know it. I don't know whether or not there was any representation made to them.

Referring to the first "whereas" clause of the license agreement, Plaintiffs' Exhibit 39c, the statement: "Whereas Licensor * * * has arranged to acquire the entire right, title and interest in and to the Letters Patent and applications set forth in list B," says that The Cleveland Trust Company has arranged to acquire them.

Q. At that time The Cleveland Trust Company didn't own the application for the Jardine patent which is listed in list B? A. Whatever the agreement recites is a fact.

Mr. Richey: The assignment in evidence will show that.

Mr. Sutherland: The agreement is contrary to it.

Mr. Richey: Well, that is a matter of argument, if you think so; but when The Cleveland Trust Company acquired this Jardine patent is a matter shown by the exhibit, which is the assignment which is already in evidence.

Q. I call your attention to Plaintiffs' Exhibit 3-D, which purports to be an assignment of the Jardine application to The Cleveland Trust Company, and ask you when that was executed.

Mr. Richey: Doesn't that show?

Mr. Sutherland: It does show.

Mr. Richey: Well, I object; it has not been shown that this witness would know any more than what is shown on the document.

Mr. Brumbaugh: I object to your telling this witness what he does and what he does not know.

The Master: He may answer.

(Narrative continued) The date appearing on this instrument as its date of execution is May 13, 1930. The Cleveland Trust Company, at the time that license agreement with Bohn was entered into, I think did own the

Jardine application, by virtue of the agreement, which is the license agreement between The Cleveland Trust Company and the Aluminum Company of America.

I am not prepared to say whether or not The Cleveland Trust Company claims title under this assignment of Exhibit 3-D, or under the license agreement; that is a legal question, and I wouldn't care to say. I have recited the fact when the assignment is dated.

The Cleveland Trust Company, at the time of entering into the license agreement with Bohn Aluminum & Brass Corporation, held title to the Jardine application under the clause in the agreement under which Aluminum Company of America was bound to assign them.

It is also a legal question whether The Cleveland Trust Company owned the Jardine application before this assignment Plaintiffs' Exhibit 3-D was made; I don't know.

I do not know why Section 1 of this license agreement with Bohn Aluminum & Brass Corporation, Plaintiffs' Exhibit 39c, limits the Bohn Company to five million pistons and piston castings per year, now I understand extended to ten million.

The limitation of five million pistons and piston castings includes the so-called commercial strut type piston.

There is a provision in this agreement which states that the Bohn Aluminum & Brass Corporation admits for all practical purposes that the commercial controlled type pistons are covered by some one or more patents owned by The Cleveland Trust Company; there is a letter attached to the agreement, from the Aluminum Company of America, according to my recollection.

Section 6 of the license agreement from The Cleveland Trust Company to the Bohn Aluminum & Brass Corporation recites, "For the purpose of the interpretation of the provisions of this agreement, it is agreed that the commercial controlled type pistons heretofore manufactured or for which castings have heretofore been manufactured by Bohn Corporation and Aluminum Company of America are covered by claims of the patent included in lists A and B hereto attached. That means the patents listed in lists A and B hereto attached.

The Cleveland Trust Company does not own any patents relating to pistons *per se* other than those listed in the lists I furnished the other day, that is up to the date of December 10, 1932.

The Cleveland Trust Company does not own any interest in any other patents relating to pistons, *per se;*

nor does The Cleveland Trust Company have any licenses under any patents other than the Maynard patent here in suit.

The Cleveland Trust Company is not interested in any way in any patents or applications for patents of Adolph Nelson. The Bohn Aluminum & Brass Corporation pays one cent on each of the so-called commercial controlled type pistons; there is none of that refunded. I don't know whether or not that accounts for why the Bohn Aluminum & Brass Corporation received 1500 shares of the trust estate, because of the Schmiedeknecht patent and one application, while the Packard Motor Company received only 600 shares for the Gulick application and two patents.

I don't know whether or not The Cleveland Trust Company only has title to the Jardine and Maynard patents so long as the license of the Aluminum Company of America remains in force.

I know there is a provision in the supplemental agreement for reassignment of all the patents and applications retained by the Aluminum Company of America upon the expiration of the license agreement.

The Cleveland Trust Company has not been indemnified for the cost of the expenses of these suits.

The Cleveland Trust Company, trustee, is paying all the attorneys who represent The Cleveland Trust Company.

The Cleveland Trust Company did not have to obtain the consent of the Aluminum Company of America before these suits were brought.

These suits were not brought at the instance of the licensees of The Cleveland Trust Company to bring suit against the Sterling Products Corporation.

The titles to the Schmiedeknecht, Gulick and Mooers patents are held in the same way by The Cleveland Trust Company as the titles to the Jardine and Maynard patents.

The license agreement Plaintiffs' Exhibit 39 and the agreement marked for identification as Defendants' Exhibit 4-V, were consummated at approximately the same time.

Mr. Sutherland: I will ask counsel for plaintiffs to offer in evidence this agreement identified as Defendants' Exhibit 4-V.

Mr. Burton: If your Honor please, I would like to make a statement with regard to these exhibits

38 and 39 last offered, and this raises the same point again,—just so that it may be clear on the record, the plaintiffs are objecting to the materiality of Defendants' Exhibit 4-S, which relates to the license to the Aluminum Company of America. These instruments which are contained in Plaintiffs' Exhibits 38 and 39 depend for whatever materiality they may have upon the introduction and materiality of 4-S, and we are only introducing them at this time for the convenience of the court, and if the court should rule that Exhibit 4-S was immaterial, as we contend, that ruling should carry with it the exclusion of this 38 and 39 because we contend they have no materiality in the case; but for the convenience of the court and the examination of witnesses and so on, we permitted them to go in at this time.

The Master: I understood that.

Mr. Burton: But they are really a part of the same question of law.

The Master: They are received under the same understanding, Mr. Burton.

Mr. Burton: On that same basis, although we contend that this instrument here is even less material we are willing to introduce the instrument marked for identification by the defendants as 4-V, which is a photostatic copy of an agreement between the Bohn Aluminum & Brass Corporation and The Cleveland Trust Company dated October 12, 1927, that has not been introduced in evidence. Under the same limitations I will ask the witness whether he is able to identify that as a copy of the original instrument.

The Witness: Yes, it is a copy of the original instrument.

The Master: It may be received, under the same reservation.

Mr. Burton: And it will be marked as Plaintiffs' Exhibit 40. And for clarity, we will state in the record that the original instrument has attached to it a copy of the license agreement between The Cleveland Trust Company and the Bohn Aluminum & Brass Corporation, the original of which has been introduced as Plaintiffs' Exhibit 39-C, no date, which license agreement has been included in other exhibits and is not reproduced in the photostatic copy introduced as Plaintiffs' Exhibit 40.

Mr. Sutherland: I offer in evidence a list of patents which has been produced here by plaintiffs as Defendants' Exhibit 4-X. This list as I understand it, represents the patents that are owned by The Cleveland Trust Company, under the trust agreement, and relating to pistons *per se*.

FURTHER CROSS EXAMINATION by Mr. Bruninga.

I had nothing to do with the negotiations of the license agreement that was granted to Walker M. Levett, National Piston Company, and Kant Skore Company. There are no licenses from The Cleveland Trust Company to those parties. There were no licenses at all to those three parties. I had nothing to do with the negotiations of the licenses from the Aluminum Company of America to Walker M. Levett, National Piston Company, or the Kant Skore Company. I don't know that The Cleveland Trust Company assumed the responsibility for those licenses.

I don't recall the papers marked for identification Defendants' Exhibit 4-Y, including a bill of complaint and answer in Equity 2732, The Cleveland Trust Company vs. National Piston Company, Incorporated, which is attested by me as assistant trust officer. I do know that there was a suit filed against The National Piston Company, Incorporated, on a Spillman & Mooers patent, the Vincent patent 1,279,184, the Church patent 1,327,149, and the Mooers patent 1,402,309; the record shows that, and also that the case was dismissed. I wouldn't care to rely on my memory as to whether or not it was dismissed by The Cleveland Trust Company, it is some years ago. The answer in that case is dated September 15, 1923 and the license to the National Piston Company is dated April 11, 1924, but I don't know whether the dismissal of that suit and the license had any relation. We weren't a party to the license agreement.

Paragraph 5 of Exhibit 38-D reads as follows:

"In case the sub-license from the Aluminum Company of America to the National Piston Company, Incorporated, a copy of which is attached hereto and made a part hereof marked Exhibit B is cancelled or terminated for any reason whatsoever, excepting the failure of the National Piston Company, Incorporated, reasonably to comply with its obligations thereunder, and said The National Piston Company, Incorporated, forthwith applies to whom-

soever then holds or controls as owner or exclusive licensee the inventions or applications for Letters Patent and Letters Patent embraced by such sub-licenses, for another sub-license upon terms at least as favorable for The National Piston Company, Incorporated, as those in said sub-license B contained, and such owner or exclusive licensee, as the case might be, fails to execute or deliver to The National Piston Company, Incorporated, such a sub-license within thirty days from the date of such application by said The National Piston Company, Incorporated, then in that event this agreement shall be deemed and construed invalid to operate as such a sub-license having the terms and conditions of the said license Exhibit B applicable for such purpose, and the National Piston Company, Incorporated, shall account thereunder directly to the Trust Company."

The National Piston Company did account directly to the Trust Company since that time; it paid royalties under that sub-license.

I don't recall whether that suit was dismissed before or after this license. I didn't know at that time there was a suit against The National Piston Company on molding patents.

We granted no license to Kant Skore.

I don't know whether before agreement 38-E was entered into April 11, 1924, which bears my signature, there had been a suit against the Kant Skore Company for infringement of molding patents held by Aluminum Company of America. I don't know whether there was such a suit in 1923.

There was no co-operation, that I have knowledge of, between the Aluminum Company of America and The Cleveland Trust Company in the settlement of controversies with National Piston Company, Kant Skore Company, or Walker M. Levett Company. I didn't sit in any of those controversies at all.

Mr. Bruninga: That is all.

As I understand, counsel is willing to admit the authenticity of a copy of the bill of complaint in Equity 535, entitled The Cleveland Trust Company v. E. C. Long Piston Company and E. C. Long, filed in the United States District Court in and for the Eastern District of Michigan, and marked for identification Defendants' Exhibit 4-E.

Mr. McCoy: Are you willing to couple that up with the fact that the suit was dismissed because infringement ceased?

Mr. Bruninga: I am willing to couple it up with a stipulation that the suit was dismissed, but I don't happen to know why the suit was dismissed.

(Further remarks made by counsel, with no agreement reached.)

I will examine the witness on it if you don't want to admit the anthenticity.

Mr. McCoy: Very well.

(Narrative continued, in answer to further questioning by Mr. Bruninga) That is my signature on the last page of Exhibit 4-Z. I knew that at that time suit was about to be filed against the E. C. Long Piston Company and E. C. Long, and I know that such a suit was filed. I executed that bill of complaint in that case. That bill of complaint included the Spillman & Mooers patent 1,092,870, the Vincent patent 1,279,184, the Church patent 1,327,147, and the Mooers patent 1,402,309. (Witness read bill to verify.) I have no reason to believe that is not a copy of the bill of complaint as filed.

Mr. Bruninga: I offer in evidence Defendants' Exhibit 4-Z.

(Narrative continued) I do not know what particular device Mr. Long and the Defendant, E. C. Long Piston Company, were making at that time which was alleged to be an infringement of the patent. I do not recognise Defendants' Exhibit FFF.

Mr. Bruninga: As I understand it, the plaintiffs' counsel know that that statement is correct, that Long discontinued the use of pistons because he proceeded to purchase castings from licensees under the patent.

Mr. McCoy: No; that is not correct. I understood that the E. C. Long Company originally made piston castings for themselves, in addition to those they purchased from licensed sources, and when they ceased to make the castings for themselves and bought the castings from licensed sources, the bill of complaint was dismissed.

Mr. Bruninga: I will take counsel's word for that understanding. Will counsel state whether this

particular device was alleged to infringe, Exhibit FFF?

Mr. McCoy: I couldn't say, because this device is a licensed casting, as shown by the marking on the casting as coming from the Walker M. Levett Company. They were licensed under the estate patents.

Mr. Bruninga: Counsel will not state whether it was or whether it was not the same general structure?

Mr. McCoy: I don't know.

Mr. Bruninga: I also offer in evidence Defendants' Exhibit 4-Y.

The Master: It may be received. We will recess now to 1:30.

(Narrative continued) With reference to Plaintiffs' Exhibit 38, the supplemental agreement between The Cleveland Trust Company and the Aluminum Company of America, the third page of that agreement in which it refers to copies of contracts hereto attached and marked Exhibits E, F, and G, Exhibit E refers to an Exhibit B. It also refers to Exhibit A. Neither of these exhibits are attached. Exhibit F in this instrument refers to Exhibit A, and Exhibit B, neither of which are attached. Exhibit G refers to Exhibit A and refers to Exhibit B, neither of which is attached.

Exhibit A of the above instrument is a copy of the original declaration of trust and agreement, and Exhibit B is a sub-license agreement from Aluminum Company of America to these various parties; there are three of them. There is no reason why they are not attached; they simply are not here. We didn't consider them of enough moment to attach them, because there are other places they are available to be referred to. The principal contracts referred to on page 3 of the supplemental agreement (after examining them) are complete with the exception of those exhibits. We could produce copies of the sub-exhibits if requested by counsel. We don't have the original agreement; we are not parties to them. There would be no objection, as far as we are concerned, to producing those agreements if counsel for the other side should request, that is, copies of them.

Mr. Bruninga: I would like to have you produce those copies for our examination, if you can produce them.

Mr. Burton: We have here a copy of the instrument referred to as Exhibit B, attached to Exhibit E, and a copy of the Exhibit B attached to the Exhibit G.

Mr. Bruninga: If you have them already in evidence—

Mr. Burton: These aren't in evidence. We don't regard them as material. If you want to do something with them, why here they are.

Mr. Sutherland: I would like the record to show that I made request to counsel a day or so ago to produce these and was advised they weren't available.

Mr. McCoy: Request was for the original agreement, to which The Cleveland Trust Company was not a party, and we did not have these agreements.

(Examination closed.)

(At 9:30 A.M., Thursday, January 26, 1933, the hearing was resumed. Thereupon, the remainder of the deposition of CHARLES L. CHADWICK was read, during which counsel for plaintiffs produced interference records in cases 2608 and 2609 in interference in the Patent Office.)

Mr. Bruninga: I object to their introduction.

Mr. Richey: I am not offering them; they were marked for identification. I call attention to them.

Mr. Bruninga: I am perfectly willing for counsel to introduce any particular depositions referred to later on in this deposition.

GUSTAVE C. MONCKMEIER, a witness called by Defendants, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. Bruninga.

My name is Gustave C. Monckmeier. I live in Davenport, Iowa. I am in the manufacturing business. I make automatic connecting rod bolts, automatic bearing caps, trunk racks, automatic windshield screens, bumper posts, and a variety of lines, also automatic hose clamps.

I am 44 years old.

In 1911 I had charge of the testing department of the Staver Carriage Company, Chicago. My principal duties were to have charge of the testing department, also some experimental work, also taking part in all the

races, plus the professional drivers that the Staver Carriage Company hired. I drove as a race driver in 1910 for the Staver Company.

I remember that there was a race in Elgin, Illinois, in the year 1911. It was August, 1911. I drove in that race. There was practicing for that race prior to that time. About seven or eight days previous to the race we was allowed to practice and test out motors, and so forth. My team mate Ralph Ireland got killed in that race.

I drove a Staver car in the Elgin race. It was an assembled car. We purchased the motor from the Teeter Motor Corporation. It had four cylinders. I remember the bore of the cylinders of the racing car that I drove. It was 4⅛ x 5, 4⅛" in diameter and 5" in the stroke. That was exactly 300.7 cubic inches piston displacement. That piston was a trunk piston made out of cast iron, special light cast iron. The car was number 27.

Q. Can you describe the pistons that you used in that car in the Elgin races?

Mr. Richey: Is this set up in the answer?

Mr. Bruninga: No.

Mr. Richey: I object to it, then, as not being set up in the answer.

Mr. Bruninga: You cannot object to it as not being set up in the answer, you can object to its use later on, but there is no provision in any statute or any decision that provides the testimony cannot be admitted.

The Master: I will receive it. Objection will be overruled; same ruling.

Q. How was it constructed? A. Well, I used several different kinds. But you want to know exactly that day in the car?

The pistons that were in that car at the Elgin races were light weight cast iron with a skirt slit, also with a T-slot on top. The horizontal T was located just above the wrist pin groove, just below the lower ring land.

Q. Did it extend part way around the piston? A. Yes.

Mr. Richey: Not so fast. I object to that question as leading. I didn't have a chance to get it in.

The Master: He has already answered. It is leading.

Mr. Bruninga: A slot, a horizontal slot below a ring land—I just want to justify myself—couldn't be anything else but extend part way around the piston or all the way.

The Master: Very well, you may proceed.

(Narrative continued) The verticals of the T were located on each side of the piston, between the wrist pin holes. It was cut all the way through the skirt. It extended all the way down to the bottom of the skirt. There was a vertical offset slot on each side of the piston. As to the offset, if I had a vertical slot, it would naturally, I thought, wear a groove into the cylinder wall; that is why I offset it a trifle. The T-slot was on both sides of the piston.

Q. And those particular pistons were in that car at the Elgin races, in August, 1911?

Mr. Richey: I object to that as leading.

The Master: He may answer. I think he has testified to that.

A. They was.

(Narrative continued) All four of those pistons were slotted in the way I have described. That car was used in the Elgin races. I received some money, in the form of my regular salary from the Staver Carriage Company and a percent that I won, for racing on that day.

Q. I am reading from the Motor Age issue of August 31, 1911, as follows, page 15: "The Staver driven by Monckmeier was brought to a halt at the pit at the end of the fifth lap so that the auxiliary oil tank, which had been broken, could be removed, and water taken in. For the want of oil, the motor had become so hot that when the radiator cap was loosened it shot up into the air and water and steam spouted from the radiator. In four minutes, however, the little car again rushed forth." Do you remember anything about that?

Mr. Richey: I object to that question as leading.

The Master: I think you may have it, he may answer and you may have your exception. The paper would be admissible, or the magazine would be.

Mr. Richey: It is not admissible or evidence of those facts, and it is the reading of the statement

of facts to the witness and he is asked if he remembered them.

Mr. Bruninga: The facts in the publication are not admissible as such except as part of the disclosure.

The Master: I assumed it was to call his attention to some circumstance. Now, ask your question; it may be admitted on that ground.

A. Yes.

(Narrative continued) As to that incident, I blew a tire on the third turn and had to go into the ditch in order to clear the road so cars coming around the turn wouldn't smash into me close to the turn. Then when I got out on the road again, after changing the tire, I proceeded to the pit and one of the mechanics changed my tires and burned his hands and the other tried to put water on there and also, I guess, burned his hands, and by going into the ditch, why, the line coming out of the power feed tank on the side, why, the weeds rubbed that off, or something, the light copper line, and I lost my line, and the motor wasn't getting any more oil and it got so hot that when I got to the pit it just practically blew up. The pistons didn't freeze. They couldn't freeze because I smashed several motors during practice when the piston was the direct cause of burning out my connecting rods, and just simply going through the crank case, and my research from that experience made me split the skirt for the reason that we used to have to cut off about—the regular standard allowance was around five thousandths but in a racing car we had to cut about 15 to 20, but still that was not enough, there was still a lot of friction created by the piston, and that is why I slit the skirt. I could have about 15 thousandths clearance with my split skirt then.

That car was never taken down since leaving that Elgin race. It was raced in Amarillo, Texas, it was raced in Springfield and Peoria, and then was shipped to San Antonio, Texas, later in the fall, I believe it was November; and the shipping clerk did not take the water out of the cars and the motors was froze up when they got to San Antonio, Texas, and that is the first time we had to dismantle the cylinders and try to patch it up with chewing gum, use anything to try to stop the water. It was raced in San Antonio, Texas, in 1911; I believe it was November. It was raced at Peoria about Septem-

ber; in Springfield also around that time, during the year 1911. I myself raced at Peoria. There was another Staver car in that race. It was called the "Staver-Chicago" car. I believe the name of the driver of that car was "Knueson." You call a man like that your team mate, in these races, if he drives another car of the same make. I believe my team mate in the Springfield races in 1911 was Knueson or Nickren.

Eddie Richenbacker had an accident in the San Antonio races in 1911; I don't know whether it was 1911 or not, or '13—so many accidents all the time.

I believe I won the Illinois championship at Springfield at that time, and I believe I won some event at Peoria. I don't know whether or not I was first in any event in Peoria in 1911; I believe I was, however. I couldn't say.

Those same split skirt pistons that were used in Elgin, were used in my Staver car in the Springfield and Peoria races in 1911, the pistons that I have described. These same pistons were used in San Antonio in 1911; we couldn't do very much due to the fact the motors had been frozen wide open from the ice and losing all the water.

I don't know what became of those pistons in that 1911 Staver. It was turned back into the stock room, the pistons, the car was fixed up, and one of them was sold, the one I had was sold to Holub Jones, coach to Iowa City, football coach of Iowa City College. Those pistons were turned back to the stock room for the reason you couldn't use racing pistons with that much clearance in a car for pleasure use. At the time those pistons were turned back to the stock room, the men who had charge of the Staver Carriage Company in 1911 were Ellingham, Scott, and another old gentleman, I really don't recall his name. Ellingham's first name is "Herb," I guess. The pistons I have been talking about are the ones out of that No. 27 car.

I did very little racing in 1912. I did some racing in 1913 in St. Louis, Peoria, Springfield, San Anton, that is all.

It was during the State Fair, Illinois State Fair that I raced in Springfield in 1913, and in Peoria during the Implement Show, and in St. Louis a special race meet on a one-mile egg-shaped track. I raced in San Antonio in November, I believe, on a three-quarters mile track. In those races I used a Special Staver, six-cylinder, 4½ x 6 Vanderbilt Cup car, that was built for the Vander-

bilt Cup Race in California, at Santa Monica, in 1914. The motor was built by the Teeter Motor Corporation, Hagerstown, Indiana. That car come equipped with pistons, but I slotted them afterwards by cutting them the way I had done previously, T-slot with an offset in the lower ring. They were cast-iron pistons.

I can produce one of the original pistons, slotted like I said, built by Teeter Motor Company of Hagerstown, Indiana, in 1912. (Witness produces piston.) That piston was in the car that I used, when Teeter Motor Company built this piston, a special light weight cast iron piston that was used in the special racing car. In some races that car had number 8, some races it had number 9, according to what position I drew at the post, what position I was supposed to start at. At that time they changed numbers according to the number of positions you drew out of the hat box.

Mr. Bruninga. The piston produced by the witness is marked for identification as Defendants' Exhibit 3-V.

(Narrative continued) I got that piston, Exhibit 3-V, out of the motor of that special Staver car built for the Vanderbilt Cup race; it was the only car built like it. This particular piston was in the motor before I started in those races in 1913. It was put there by the Teeter Motor Company. The first time I saw it it was in the motor. The piston was not slotted like that the first time I saw it, for the reason that those people didn't believe in any of those new-fangled ideas. I slotted it like that at Peoria, Illinois, before the Peoria race. I don't know in what shop I slotted it. If I had trouble I always went to the next one I could find, the quicker the better.

That particular piston was used in that Peoria race. That same piston was also used in the Springfield race of that year. It wasn't used in the St. Louis race because I run hot there—I don't know; I don't believe it was slotted there. It was slotted in the San Antonio race of 1913.

I also raced in 1914 with the Staver No. 9, the same car I had raced in 1913, except a No. 9 on there which was placed on there in San Antonio, Texas. I drew No. 9, I believe, down there, and that number always stayed on the car thereafter.

I received some money for the 1913 races. I got some money in San Anton, got some in Springfield, got some in Peoria, practically every place I went. I only got half

of that money, the Staver Carriage Company got the rest.

I didn't race in any towns except the above stated ones in 1914, for the reason that the Staver Company wasn't doing any racing. The stockholders voted against racing in 1912. We did a little racing in 1913, and it was charged I believe to advertising or something.

The particular car that I used in the 1913 races I also used in 1914. The Staver Company owned part of that car in 1914. I bought it on the payment plan, in the early spring, around April of the year following the 1913 races.

I didn't race in any big city during 1914 because I wasn't driving professionally for them any more; I was free-lancing, for the reason I couldn't afford to finance myself on big national events.

In 1914 I raced in Streator, Illinois, Carfield, Illinois, Peoria, Illinois, Kowanee, Illinois, LaSalle, Illinois, Leroy, Illinois, and Mattoon, Illinois, Iowa City, Iowa, Tipton, Iowa, Williamsburg, Iowa, Florrind, Iowa, Maryville, Missouri, Bethel, Missouri, Auburn, Nebraska, Nebraska City, Springfield, Missouri, Tulsa, Oklahoma, and that is all.

I have one of the pistons here that were used in that car up until September 1914. I mean piston, Exhibit 3-V. The new piston was used after September. That was an aluminum piston.

I believe a number of mechanics saw that original piston that I made in 1911 prior to the Elgin races. I believe the ones who saw it were Ray Latham, Knueson, Herb Ellingham, and a brother of his.

I had help in slotting those pistons before the Elgin races; I used to have a good many flunkies helping me, that would help me do this and that; I believe one of the Ellingham boys was one of them. I always put the piston in myself, excepting always had somebody help me let the cylinder block down.

Emery T. Knueson, my team mate, saw those pistons in 1913 like Exhibit 3-V. I don't remember any other in 1913, unless some of the boys, some—yes, when the car got back to the factory for a little overhauling, I don't know.

I said the pistons 3-V were used in that Staver car No. 9 until September, 1914, and I put another piston in. It was another special make, that was an aluminum piston with a special head. I don't know who made that piston. I don't know whether I had it made in Chicago or

Cedar Rapids. I had the pattern made and had the piston cast, and I had it machined; I don't know whether it was Chicago or Cedar Rapids; I couldn't tell you; I have been trying to find out; I can't tell you.

That car had six cylinders. I used those aluminum pistons in all cylinders. I have one of those pistons. (Witness produces one.)

Mr. Bruninga: Piston produced by the witness is marked for identification as Defendants' Exhibit 3-W.

(Narrative continued) I slotted that piston, Exhibit 3-W, before it was used. It was afterwards used as slotted.

One of sides of that piston is broken away, and it had a slot on that broken side just like on the other side, and that piston wouldn't have the other slot there. I had a fire, warehouse burned up in Tipton, Iowa, where I kept all my relics, junk, and so forth, and the patterns burned up and the pistons, and I just got two or three of those pistons left. I have one or two more of them. I don't know where they are—yes, I believe I can find them. I have searched for them. I have another one but I haven't the rest of them. I didn't tell you that I had another one, and I didn't even know I had this cast iron one, I didn't know I had it, I never seen that piston since the fall, September, 1914.

When I put these aluminum pistons like 3-W in my car, I took the cast iron pistons like 3-V out. Now I know, because this was one of my spare pistons that I would change. That is how I happen to have this one, but I didn't know it still existed until that time when I was hunting for pistons a couple of months ago. This 3-V was one of my spare pistons, the cast iron one, that is why I happen to have it.

I didn't find that piston, you (indicating Mr. Bruninga) found it. We was down there looking for the aluminum pistons and I run around and I could only find that one and you looked under the junk box where my trunk was standing on, and you grabbed a piston out of there, out of the corner. That is the first time I have seen it since 1914. I didn't know it even existed, it was just like a shot out of the sky, like a piston that dropped right out of the sky into your hands. I saw you pick it up, it was my piston. I didn't know it was still existing. That was in my garage in Tipton, Iowa, in which I keep a lot of experimental stuff, bench and a lot of relics. That

garage is locked and boarded up. I took you over there and we found that piston.

This aluminum piston, 3-W, I made in 1914. I used them in 1914.

Q. In any races in 1914? A. Yes, that piston—am I supposed to tell you whether it was used or not?

Q. Yes, I am asking you whether it was used in any races? A. Yes, it was used in Iowa City, it was used in Williamsburg, it was used in Tipton, it was used in Florenda, it was used in Maryville, Randolph, Nebraska City, Neb., Auburn, Neb., Tulsa, Okla., Clinton, Iowa, Beckwith, Mo., and Maryville, Mo.

(Narrative continued) I won practically all of those races. They were all small towns, non-sanctioned race stuff. I wasn't driving professional any more, unsanctioned.

None of those pistons in 1914 scored on me, or were worn so bad they would go to pieces.

I wintered in Davenport, Iowa, for about three months in 1914 and 1915, and then went to Tipton, Iowa, where I knew a gentleman that wanted to ride with me in the car in 1915. Tipton is 38 miles from Davenport. I have a home in Tipton, but I live in Davenport now. The man who wanted to ride with me was Mr. Everett Shipley, who is now dead.

A number of people in Tipton saw those pistons, especially one boy who worked, or roustabout in the garage where I kept my car, and did some repair work on my car, by the name of Jack Henderson. Henderson actually saw those pistons like Exhibit 3-W. I know he seen it, because he mentioned I had a cracked piston in there, my pistons were cracked. I explained to him they wasn't cracked, because I wouldn't have explained it at all if he wasn't just a boy trying to learn the business; that is why I explained it to him.

Mr. Richey: I object to his answer, states his conclusion that he must have done it.

(Narrative continued) I raced in 1915. I raced in Anamosa, Iowa, in 1915, in the early part of the year. I raced, in addition to Anamosa, in Iowa City, Marion, Williamsburg, and Tipton, Iowa. I won some of those races. I received some money for winning those races in 1914 using the aluminum pistons like 3-W.

I used aluminum pistons in the 1915 races.

I didn't intend to race in 1916 but I did. I used the same Special No. 9 six-cylinder Staver car that I used in

1915. I had the same pistons in that car in 1916. That car was sold in 1916 to a man by the name of Gallmeier. I started to make delivery. He gave me, it was sold for $850, and he gave me $200 down and the balance was supposed to be in bankable notes when he got delivery of the car, and I proceeded to fix the car all up for him and I was also supposed to show him how to race with it, and in the meantime, before I had the car finished, he hung himself.

The paper marked Defendants' Exhibit 3-X, dated June 20, 1916, which you have just handed me was my original agreement that I wrote up and he signed it. That is Mr. Gallmeier's signature, and his widow still lives right in Clinton, Iowa.

That picture on Exhibit 3-X was a photograph taken in Iowa City with several cars, and I simply cut the other ones out and had a cut made of it and used it for advertising, used it on postcards and sold them for ten cents apiece. The gentleman in the lower left-hand corner is myself as I appeared at that time. No, this picture is not at that time; it was taken from off of another photograph that appeared in the Chicago Tribune when I won the trip around Lake Michigan in 1915, simply cut that out and made a cut of it. This picture is a picture of the Iowa City race of 1914.

Mr. Bruninga: I offer in evidence Exhibit 3-X.

(Narrative continued) This Mr. Gallmeier didn't get the car. When I overhauled the car I put new—tightened up the bearings, relined the main shaft, and perhaps put in some new wrist pins and made him some new piston rings—whatever was needed. I left the piston Exhibit 3-W in the car. I only had five original pistons and I never bought any more pistons and these are the last pistons I had made.

I simply started racing myself that year, that summer and fall again, and I wound up with it in October or November, I don't know which. When I got through racing I came back to Tipton, I started to run a shop back of Carroll Garage and started a repair shop, and had several men working for me, three men working for me, and the next spring, why business was so rushing I had four men, and was too busy to race again. I didn't bother with racing no more, and the war began and some of the men went over to France and I simply didn't race, there wasn't any more racing. The car was in Tipton. I don't know where it is now—I believe it was sold when I

sold it again; it was sold, and I sold it to a man, a Mr. Sindt for a Ford car and a $200 note, on which I had to sue in 1923.

I didn't leave the pistons like 3-W in the car; they were taken out, for the reason that Sindt, I was going to help him fix up the car and the motor was all torn apart and I was supposed to give him all assistance in timing the car and putting it back in A-1 condition. I advised him to have the cylinders reground and new pistons, which were naturally needed when it was reground, and that is how I kept the pistons, and I especially kept the magneto. I still have that magneto. I didn't keep the pistons for any particular reason, just simply a couple of them, about three of them I kept, not intentionally, for no reason whatever, just accidentally, that was how.

I said the piston 3-W went through a fire. That was in Tipton, Iowa. I had a small warehouse alongside of the factory there, that was struck by lightning one night. I had baking enamel, or dipping enamel, and some lacquer, and it caught fire and I lost my patterns, a good many patterns I lost in the fire, plus those pistons was in that warehouse and went through the fire.

I have not made any other pistons like Exhibit 3-W since September, 1914. I made only one set of them. I believe I designed a set of pistons for a man by the name of Jordan, for a National racing car, that was in the fall of 1914 or 1915, I couldn't say, but I never built any more myself for this particular car.

With reference to the cast iron piston, Exhibit 3-V, I never made any more slotted cast iron pistons after I made the set of which this is one, for the reason they were too heavy. I wanted more speed.

The T-slot in the piston used in the Elgin races was originally put in there for the reason I busted some of the motors in practice, which was due directly upon the friction, upon the high speed that the piston created in conjunction with the cylinder walls, and made such tremendous pulling and pushing pressure upon the bearing that I simply burned the bearing out, had to work too hard.

When, as you said you showed this piston, or other people saw it, did you tell them anything about it, or don't you remember? A. I never told my—I always kept those things away from my team mate. I wouldn't keep them away from my mechanic who was working for me, excepting I wouldn't let the outside drivers for the State of Iowa team with me; I was just a starter as a

professional, I just won them, I didn't let them know it, no.

(Narrative continued) I didn't hide it from Ellington, the mechanic, because the car was brought to the factory several times and I wasn't there, either on tour driving or some other publicity stunt. I didn't try to hide it from Knueson, after he found out. I didn't try to hide it from Henderson, that was in Iowa, then. I didn't hide it, neither did I advertise it. I made money by using those pistons in the car in the races. I don't know whether or not you can attribute that to the pistons, Exhibits 3-V and 3-W or not, the only thing I know I always had a faster car than my team mate, which were identionally alike except for the piston.

You got in touch with me through a man by the name of Packer, who was at one time connected, when he first graduated from college, he was connected with the Staver Carriage Company in Chicago in 1911 or 1912, somewhere around there, and he is now editor for the Motor Service, publishing a magazine in Chicago, and he in turn told Mr. Hunter, who is the manager of that publication, and I believe I mentioned something to him about this last summer, we was talking about old times. I said to Packer, "Yes, do you remember those old pistons I made?" And he said, "Yes." I said, "I wish I had gotten them patented." Hunter talked up on the pistons, he said, "Do you know anything about split skirt pistons?" And I said, "Yes, a little bit." That is all that was said about it, and the first thing I got a letter from Mr. Hunter, who is the manager of the Motor Service magazine, and that is how it came about. And the next thing that happened, you (indicating Mr. Brueninga) appeared on the scene.

I don't know anything about this case. I don't even know who the defendants are.

I don't know anybody of the Ray-Day Company that makes Ray-Day pistons. I do not know anybody connected with the Sterling Products Company of St. Louis, excepting that I had a letter from you, or them, I don't know—Sterling Products.

I wish I had a financial interest in this case.

Q. Of course I have promised to pay your expenses, haven't I? A. Yes. Did you?

Q. I admit I did. A. Well, all right.

(Narrative continued) You sent me some money for coming to Cleveland. Nobody asked to subpoena me. I don't know if you asked me as a favor to come here. You never asked me as a favor. You asked me if I would go down or do something, I don't know—go down to Cleveland, yes.

(Short recess taken.)

Cross Examination by Mr. Richey.

Mr. Richey: I want to renew my objection to all the testimony on the ground it has not been set up in the answer.

The Master: Same ruling.

I never gave Mr. Bruninga those pistons. He came to see me in Davenport, Iowa in September, I believe, or August 1932; I really don't know.

Q. And when was it that the editor of the paper, Packer, get in touch with you about this matter? A. I went to Chicago—Packer wrote me a letter, a four-page letter, telling me a lot of the things that used to happen about 20 years ago, and was kidding me for the reason that he seen one of my advertisements in the paper, or he seen my name written under a letter that was sent to the Motor Service Publishing Company, and then he wrote me a letter. That is how he happened to know I was in Iowa. So the following time I went to Chicago I stopped in there and we had a little old time reunion, and when I met Mr. Hunter we got talking about different things.

Q. Pardon me for interrupting, I just asked you when that was? A. July or August, 1932.

(Narrative continued) The Staver Company that I mentioned manufactured automobiles and carriages. They manufactured automobiles since 1909 to 1914, first part of 1914 they quit. They were a well-organized company, and had records and all that kind of thing that those well-organized companies do. I was not hired by them to race a car. I was hired by them to take charge—I started to work at the Staver Carriage Company, in December, 1909. Mr. Holt, who formerly was at the Teeter Motor Company, got to be manager of the Staver Carriage Company, motor building division, and he wanted me to take, to go up there and take charge of the testing department of the new cars, which I did, and that is all I

did until the Elgin races. In fact, the Hawthorne dirt track, that was my first dirt track race, in July of 1910, and the Elgin races, and then I also drove in the Elgin races, plus two expert professional drivers they hired, because I was not an expert racing driver at that time, that was just my second race. Then I drove that fall in making the five state tour, together with another driver, or whatever they called it. Then the following year we built cars for publicity purposes and racing, which cars the Staver Company, I believe, voted $42,000 for racing expenses, on experimenting and developments, and which I mostly got my experience out of. That is all the Staver built these cars for, racing purposes. I became quite skilled in racing. I don't know how long it took to become skilled in racing after I started it; you learn something every day. Racing is a kind of special use of automobiles, and requires a special kind of skill in driving. Special kind of cars are used in racing today, but not at that time. You was permitted to have only such things on the car as the stock car specification called for, unless it was a free-for-all race. Therefore we built 25 motors exactly alike, with a special cam shaft, with special light-weight pistons, and bodies, but the cylinders and everything else was absolutely stock. The cars were built especially for racing, though.

I said that I allowed these pistons, like Exhibit 3-V, fifteen thousandths clearance, twelve to fifteen, before I split them, and a little less after I split them. I realized that less clearance because it wouldn't slap so much and I was able to get more power by a little less clearance, and let the skirt expand.

Q. My question is, you say you had these pistons in the car with fifteen thousandths clearance before you split them? A. Yes.

Q. Then after you split them you fitted them with less clearance? A. With the same clearance, only they were split.

(Narrative continued) I believe I allowed twenty thousandths clearance when I got these aluminum pistons; I couldn't tell you exactly any more. That was after I split them. It was a special design piston. Another one of my ideas, a concave top, I thought to get the blow more to the center. I had these built special, everything turned up and I split them. I had the same clearance before I split them as I did afterwards. I had these

aluminum pistons in a six cylinder car. I had seven aluminum pistons, one extra one in case of damage to one of them, or something like that.

Quietness is not sought for in these racing cars; piston slap is no matter of consideration.

I didn't find this iron piston, Exhibit 3-V; it was found in my relic box that I had in Tipton, Iowa, in the garage. Besides these pistons, I have in that box some steel, some spring wire, automatic bolts—just a junk box, that is all, things I will never probably use again. I didn't even know I put this piston Exhibit 3-V there. I didn't know it even existed. I knew at one time it existed, you see, but I had changed pistons, junked pistons, and I even didn't know I had one left until Mr. Bruninga rummaged around and he found it,—well, it was—I actually felt foolish. I hadn't forgotten it was there—I never put it there; otherwise I would have known it. Maybe my wife put it there, found it in the house someplace and put it in the garage in the junk box; maybe one of the boys working for me in the factory put it there. That piston had not been in that box for 15 or 20 years, because that box was only built, that box was—let's see—in 1917 or 1918, something like that. It had been in the box since 1917 or 1918, about that. This piston was flying around some other corner. I got a big room upstairs where I keep a lot of records, patent matters, piston inserters. I formerly made piston ring inserters down there.

In running these races sometimes you try to keep everything about these cars in prime condition, and sometimes you don't. I don't like to race a car with a defective piece of apparatus in it if I can help it, if I can help myself. You wouldn't drive with a defective spindle on a car or a cheap piece of steel in your axle shaft. If you have a defective piece of mechanism, it is liable to break and throw you out of the race, if not injure you; I got stopped a lot of times by not even defectiveness, merely neglecting the gaskets from the carburetor, or generator wires, or a lot of things happen. I usually inspect my machinery pretty well before I race, but always something new happens, sometimes. You look over things carefully so you won't be delayed or hurt by some defect, before you go into these races, but you get careless at it.

This piston, Exhibit 3-V, was never put in any other car except this racing car.

Referring to the aluminum piston, Exhibit 3-W, I had that, I have got another one or two. It was in the garage. It was burned in the fire in 1922 or 1921. It was in the warehouse with some patterns and a whole set of pistons. The rest of them were junked, but I kept three of them. The rest were burned beyond recognition. They were aluminum.

Q. What do you mean by "beyond recognition"? A. What is the use of keeping a piece of junk that is all burned up? I have too much junk now.

Those aluminum pistons were in the warehouse, prior to the time they were burned up, among some patterns of different description, and it was burned up, that is all; lightning struck it. In the warehouse the dipping was done, dipping piston inserters. I made an automatic piston inserter that had springs all around it, you could just shoot the piston right through, automatically compress the rings. You can still buy them on the market today.

Q. What was the purpose of the automatic spring piston? A. Can I show you? These rings here are hard things to put in, especially in the old Model T Ford, because the mechanic tries to put them in this way, puts a clip around, and the piston is a little tight, and the sharp edges project, and he finally snaps this one in, and the final one, he snaps his finger on it, and otherwise, and with a piston inserter you can stick this piston in, automatically push it right through, it closes the rings up and shoots it in without injury to your hands.

If you don't use piston rings you can't drive, the pistons without rings, you have to have piston rings to have the pressure; but they have been used without rings.

Q. Did you get that up to take care of expansion, prevent scoring, things like that? A. Yes—not the piston inserters; that was a tool to put the pistons in the cylinders with. That was a tool, that automatically compresses the rings on the piston so you can get rid of that trouble.

(Narrative continued) These pistons like Exhibit 3-W were put into the warehouse in 1919 when we moved from one place to another, when that warehouse was used for dipping piston inserters.

It is accidental that on one side of Exhibit 3-V the slot was not cut through at the top; it wasn't cut through; it is supposed to be cut through, yes, I notice that, but

that is all right. It is supposed to be cut through on both sides. On the other side it is broken away at the top, perhaps, because the milling cutter was so big it would cut into here and it was broken. To make the slots in Exhibit 3-W, I drilled and sawed them out, because there was no milling machine handy. I first drilled a series of holes and then sawed it right through there. All of the slots in these pistons were just like those shown in these two I have produced here. That is, a trifle offset, which I thought would eliminate cutting a groove in the cylinder wall.

Q. You made them all the same way. That is, the iron ones you cut in with a milling tool and the other ones you bored out and sawed? A. I couldn't help myself otherwise.

(Narrative continued) Of all the races I won, I won't say that I won them due to my skill as a driver, otherwise they wouldn't have hired other professional drivers to team with me. During the years I won a lot of those races. I don't know whether or not I won a great many of those races due to my own skill. I don't think I used extraordinary skill. I never had very many accidents. I tried to be as careful as I could.

I ran a good many races in 1910 without having pistons that were split. I won some of them. Let me see, I raced—three or four. I ran perhaps six races my first year. I won two-thirds of them to begin with. I won a higher average than that later. I said I won three or four—I don't know whether three or four out of six. I could name exactly where I raced. I raced in Hawthorne, I raced in Elgin, I raced in Minneapolis, I raced in Peoria, and I raced in Springfield. Well, I guess I won about three or four out of six or seven.

Every race we had one or two or three events. You see, I might run in two events in the same day or three events, or I might only run in one event. There are class races; and they had events for the 161, and the 230 class in 1911 was a little larger motor. Our stock motor was 4½ x 5, and the stock motor was put in a different car that would bring us into the class of 301 to 450, so we took the pistons and we built special, 25 special motors of 4⅜ x 5, which brought us into the 300.7 piston displacement, which was just a few notches under the 301, which brought us into the lower class.

I ran, maybe, 20 races in 1911. I won perhaps ten or eleven of those, I don't know, I couldn't say.

In 1912 we didn't do much racing for the reason that the stockholders for the Staver Carriage Company wouldn't stand for my racing cost, the racing cost was forty or forty-two thousand dollars in 1911, so they cut it out for that reason. I did a little racing, which was charged to publicity, especially that trip around Lake Michigan, which was I believe a fourteen or fifteen hundred mile tour, of 25 or 30 starters, and I won that, and that was the main one.

I didn't run very many races in 1912; a couple of them; two or three of them. I didn't win any of those, because I was just—I drove an Elkhart, and they didn't know it was me driving because it was a non-sanctioned meeting, and I won that one. I drove without their knowing who it was, because I would have been barred by the Three A's, American Automobile Association. They would have barred me because it was a non-sanctioned meeting, small country class, they want to have a race meet, and no one wants to pay $100 or $200 for an official to come down from New York to start the flag to start them off, and they run their own races and call them non-sanctioned.

I ran perhaps twenty or thirty races in 1913—maybe 13, 14, 15 or 16—I don't know; a good many. I won about half of them.

Q. In 1914 how many did you run? A. Pardon me; did I hear you say you wanted to know how many races I ran in 1913?

Q. Yes; how many you drove and how many you won? A. I didn't drive very many races in 1913; probably eight races.

Q. Now, a while ago you said twenty, now you say eight. A. Pardon me; I thought it was 1914, you see.

(Narrative continued) When I said I drove twenty races in 1913 and won ten of them, I meant 1914.

I drove seven or eight in 1913; in four different cities, I believe, and different events; maybe I run in two events of the class. I probably won about half of them.

I don't remember how many I ran in 1915; 20, 30, or 40. That has been a long while ago. I can name you the towns all right, but I can't name you exactly how many events I drove all told. I could figure it out for you.

I thought I was going to quit racing in the fall of 1915, but I didn't. I raced in 1916; I probably ran in

15 races in 1916. I don't know how many of those I won; about half of them. I couldn't say. It wasn't nothing like winning all the time; and I couldn't take everything, because I always had one tall fight on my hands at all times; the boys were trying to bar me from the track, because I had too fast a car for them; and they had districts they barred me in a number of races. They weren't professional drivers any more than I was. They claimed I had too fast a car for them.

Mr. Richey: I object to what he says they claimed.

The Witness: Well, they disbarred me because of that.

(Narrative continued) The Staver Company assembled these racing cars. They only built four racing cars in 1911, three permanent and one spare. But we had 25 motors of the caliber, with the same size cam shaft, pistons, and everything, all 4-3/8" size, in order so that we could call that car a stock car.

They built other cars besides racing cars. They built pleasure cars. In 1911 I believe they turned out, highest production, three or four a day. That was increased in 1912 but I couldn't tell you exactly. They didn't go out of business; they simply quit for the reason that we had also a little depression in '13, and Harry Staver, President of the concern, wanted to divorce the automobile department away from the carriage department so he could have larger capacity, more workmen, and he went to New York and couldn't raise the amount of money so he could separate the two properties; so he just quit.

The Staver Company didn't make any racing cars in 1911, in addition to those four, excepting the one that I built up myself from stock, and a few things special; I just drove it for publicity, for the dealers.

The Staver Company never put pistons like Exhibits 3-W or 3-V in any of their cars, either racing or pleasure cars. They used the iron trunk type piston. The Teeter Motor Company that built them, I always had to take them down, and we assembled them ourselves and we polished the walls with white lead and various tricks that we thought, that I thought might give me more speed, that is all I was interested in, more speed. I didn't go down to the Teeter Motor Manufacturing Company and help them to fit the pistons in the racing cars,

they shipped the motor to Chicago and we worked on it at the shop.

They also bought their pleasure car motors from the Teeter Company. I was sent down there in 1910 to look over their motors, and they sold me on their motor, and we changed from the British-American and the Continental motor to the Teeter motor, which put the Teeter people on the map, and after that perhaps a dozen firms used the Teeter motor, started using them in 1913 or 1914. That is, the Staver Company sent me down there to check over their motors, see how they worked, and through my recommendation they shifted to the Teeter motor.

The clearance in the pleasure cars, between the pistons and the cylinders, was, oh, six thousandths, four to six thousandths. Some of them were tapered. It was all in an experimental stage which was the proper clearance, sometimes gave a taper clearance of four to six, three to six, sometimes five or six straight down; more or less experimental; there was no standard.

I did not recommend to the Staver Company that they use this kind of split I had in the cast iron piston; nor did I recommend it to the Teeter Company.

Q. And you did not recommend the aluminum piston like 3-W with the slit in it, to either one of them, did you? A. The company was not building automobiles then any more. I did get a bawling out from Harry Staver at one time, yes.

Q. What did he bawl you out for? A. Not exactly bawling out, but anyway, or somebody told him I had—was certainly getting off my noddle or something, using pistons like that, and he wanted to know why.

Q. So the Staver Company, you claim, didn't know about it? A. Well, some of the boys, I suppose some of the boys didn't like me very much, or something like that; anyway they thought they better tell something on me, what I was doing, probably ruin my reputation.

(Narrative continued) The Staver Company and the Teeter Company, of course, were looking for improvements; they were working along, experimenting, trying to develop their equipment.

I was paid my salary and expenses in these races while I was with the Staver Company. I was working on a salary and expenses.

The name of one of the flunkies I had working for me was "Ray Latham." I don't know where he is now; I didn't try to find out.

Herbert Ellingham is in Chicago. I know where he is but I don't know his address; I can find it though. I don't know his brother's name. I called one of them Herb and I called the other one "Red," his nickname. I guess he lives in Chicago; I guess they both live in Chicago. You probably could locate them there by looking in the telephone directory; I don't know.

The name of the fourth man who knew about these pistons is E. T. Knuesen. He is now in Washington, D. C. I can send his address to you.

There is another fellow by the name of D'Vorsky that knows about these pistons. His initials are "R. W." He is located at Shreveport, Illinois. He was in Rockport, then Shreveport. I believe he is in Chicago now. I know his address in Chicago, but I couldn't tell you offhand.

Jack Henderson, whom I mentioned, is in Wheatland, Iowa.

These holes were bored in these pistons, Exhibits 3-V and 3-W, to lighten them; also you will notice they have a very thin skirt on there, a very thin, thinner than the stock car piston. It was cast that way, special cast all the way around; made special piston patterns for that casting for that car. That was specially built for the Vanderbilt Cup Race in 1914, run in Santa Monica.

I have an automobile repair shop, started in the fall of 1916. I have to replace pistons in cars in repairing them. I have not put any of the standard types of aluminum pistons in any of the cars that I have repaired. I never had any split skirt pistons that I put in any of the cars I have repaired. I have had cars that had piston trouble; I have seen aluminum pistons with the head broke out of them, ring grooves worn—yes, that's about all. I have had cars in with iron pistons that had piston troubles, too. If we had trouble with iron pistons—one thing, they were too heavy, and another thing, they were worn and plattered, and I used to take them and expand them.

In the repair work I have done since I have quit racing, I have had trouble with iron pistons I have had to repair; it wasn't trouble; they were worn out, that is all; had to expand them and put them back in again, and make a better piston out of them.

I have seen aluminum trunk type pistons scored. I have seen them have trouble, that is, scored and melt in the cylinder wall. When I found such pistons I re-

moved them, throwed them out and put in some other pistons. I believe I substituted cast iron and aluminum pistons for those; used any standard piston at that time, for all cars. I was only in the repair business for a couple of years. I never did like to replace pistons, because I always expanded the old pistons that were in the car.

I said I had seven of these aluminum pistons. I used all seven of them.

Q. What was the occasion for using the extra one? A. Do you see this ring here? (Indicating on aluminum piston.)

Q. Yes. A. These grooves got worn, had widened them out. Probably started out with a 3-16" groove, and kept on widening it out. You see this gets worn. That is all I needed, was piston rings.

(Narrative continued) All of those pistons got worn there in the grooves. It would probably take a season's racing, or a half-season's racing for them to wear that way in the grooves; under high speed they wear very rapidly. I had only one extra piston, and I used that extra piston.

I ran that car with these aluminum pistons in it from September '14 to '16. The only thing I had to replace was the rings, and I believe I replaced wrist pin walls. I said I had seven pistons like Exhibit 3-V, for a six-cylinder car. They wore out in about the same way that I said the aluminum did. You can see where this groove was widened out several times. They would last longer than the aluminum. They clattered a little and you would have to use a lot of oil. They clattered when you started; have to use heavier oil. In starting up these pistons, Exhibits 3-V and 3-W, would clatter a little bit and you would have to have a little oil in there.

I used this particular Exhibit 3-V piston. The reason I substituted a piston like Exhibit 3-V for one of the others, was, perhaps, the rings were bad, or you would break a ring on there; you can't get exactly the same size rings wherever you are, the smaller cities; you would have to keep special made rings; you couldn't buy them always; had to have special rings along; and all I had to do was to take a piston and change a piston ring.

Mr. Richey: That is all.

Mr. Bruninga: No re-direct.

(Adjournment taken to following day at 9:30 A.M.)

(At 1:30 P.M., Friday, January 27, 1933, the hearing was resumed).

Thereupon, HERBERT FRANK ELLINGHAM, a witness called by Defendants, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. Bruninga.

My name is Herbert Frank Ellingham. I live at 3938 West 61st Place, Chicago, Illinois. My business is automobile repairing at the present time. I came to Chicago in the spring of 1911. I started to work right away after I came to Chicago. I came right from Racine, Wis., and started right in to work at the Staver Carriage Company, that was in the automobile department. The Staver Carriage Company made a car in 1911 known as the Staver car. Up until 1914 that company was called Staver Carriage Company, automobile department. Then in 1914 they reorganized and called it the Staver Motor Car Company. I was with the company at that time. I stayed with the Staver Company until November, 1930.

I attended automobile races around Chicago. The first one that I attended was in Elgin, Illinois, in 1911. That was rated as the biggest race of automobiles in them days. I remember one of our drivers, Mr. Ireland, got killed there, before the race, at practice time. By "one of our drivers" I mean one of the Staver team. We had three teams, three cars. Both raced at that time. The drivers were Ireland, Gus Monckmeier and another man there that they hired just for this race. We had two of them; I can't remember, can't recall his name—Luther, or something like that; he was just there to drive that one race, that was about all.

Mr. Monckmeier's full name was Gus. That is all I ever called him. He was an all-around driver, usually the final tester; in other words, he done all the experimental work around there, testing cars, and he also drove in races. He drove a Staver car in the Elgin race in 1911.

My job at Staver's at that time was, I had charge of the stock room, getting out all the parts. It was an assembled car. I had to furnish all the parts, from rear axle, whole complete car, build it up, furnish all the parts, put them out on the floor so the mechanics could rebuild the parts and make cars with them.

I was born in 1894. I was about 17 or 18 years old then.

That Staver car that Gus Monckmeier drove had a Teeter motor. I saw that car myself. I was at the races and saw the races. I saw Gus Monckmeier drive in that race. The bore of the cylinders in the car that Gus Monckmeier drove in that race was 4⅜ x 5, they called it. 5 was the stroke. It had four cylinders. Just cast iron pistons were used in that car that Gus Monckmeier drove in that race. I saw the pistons; I helped put up his car. He came in there one day and he wanted somebody to help. So I helped him, tore down the lower case, I remember that because I got all full of oil and grease. He said he had to have it running right away and he asked for help, wanted me to work there that evening, so I worked on it and helped him put up the pistons and the rest of it.

The pistons that were put into that car before the race were the common ordinary cast iron, stock piston, which he sawed with a hack saw, and slotted a sort of T-slot below the piston ring, and kind of a jog, too, on the side of the piston. I remember when he was doing that I said he was crazy, the pistons would never hold up. I thought they would fall apart. He said, "No, I know what I am doing. Somebody help me with what I am doing so I can get it together."

The slot was from the lower side of the ring, and slotted up on the side of the piston, and then drilled a hole so he could get the hack saw up, with the jog up to that slot. That was known as a trunk piston, cast iron piston with a head and skirt and wrist pin bosses projecting inwardly.

The slot that had an offset and extended on one face of the piston downward, was just opposite the wrist pin. The wrist pin comes here and the slot on the other side, just the opposite. I mean right between the wrist pin bosses. I would say that slot was on both sides. I remember when he was putting it in, I said, "Gus, what are you putting these in these pistons for?" I said, "These will never hold up." He was one of these funny, farmer boys, and he said, "I know what I am doing. All you have to do is help me get it together."

The reason he gave for putting a T-slot in there was that it would take the place of the expansion and contraction of the piston, and it wouldn't stick. He burned up two motors before that from the pistons freezing in the cylinders and breaking the two motors. I know he had trouble with two motors before that. He said to me, he

said, "Don't worry. I know what I am doing." He said, "This is going to take care of my trouble." He wouldn't talk much; he was a kind of a funny fellow. I said I would help him put those pistons into the car. That was before the Elgin race. I worked on them that afternoon and evening with him. He used that car in that race and I saw him race.

That Staver car had a pump oil system. The lubrication of the crankcase was the splash system.

I saw those pistons after the race. We didn't tear these cars down until he made two or three other races. I know he went to Springfield, and the last race was down in Texas, and they shipped them back then and we tore the motors apart and took the parts and put them in the stock room. We still had parts up to a couple of years ago, the ring gears and pinions and cam shafts. We only had special cam shafts and pistons in them, otherwise they were a stock car.

I saw those pistons after the cars came back. None of them were broken. We took the pistons out of the car, to build another. In Riverview Park we had a motordrome, and we assembled one of these cars with standard stock parts and turned it on that track, just for a show. It was a bowl like a ninety degree bowl, about the size of this room, built on the track. We took those pistons out of there and took the ring gears out of there and cam shaft and built common stock cars so as to advertise the Staver name. After those particular pistons were taken out of his car, they laid in the stock room for quite a while. I can't say what was done with them; might have junked them. I was in the stock room at that time and until 1916.

The Staver Motor Company continued in existence and I continued working for that company. They kept on building cars up to 1914. The car that was built in 1913 was also a four-cylinder car. In 1913 and 1914 we built fours and they called them the 45 and 55, and then some 65; 55 was the six-cylinder car and 45 was a four.

I remember the 1913 racing car. We shortened the frame on a four-cylinder car, shortened it up so it would be shorter, then put a six-cylinder motor in it. We always called it the "Betsy," and didn't have a number on it, as I recall it. We always called it that. They finally sold it to Mr. Gus Monckmeier about 1914. The bore and stroke of that car was 4½" diameter by 5" stroke. That was also a Teeter six motor.

With reference to the pistons that Mr. Monckmeier made or slotted before the Elgin race, I am pretty sure there were five pistons slotted for that four-cylinder car —four in the car and one extra.

Q. Did that piston have ring grooves on it for piston rings? A. Which one?

Q. That one, the pistons that were slotted, did those have ring grooves in them like ordinary trunk pistons? A. I don't think so, not in 1911.

Q. Did it have piston rings on it? A. It had piston rings on it.

Q. What did those piston rings mount in? A. Oh, a ring groove, yes, sir.

(Narrative continued) That is the only time I saw Monckmeier slit any pistons, before the Elgin race. That is the only time I know of. Those were cast iron pistons.

As to the business of the Staver Company after the assembly of cars was discontinued—we called it the Staver Motor Car Company, and we done general repairs, and sold parts for all the cars we had out, and repaired all the Staver cars. We had about 1200 cars out and we figured they had to have cars repaired, so we just took over the service station.

Referring to Defendants' Exhibit 3-V piston, that particular piston is like we had in the six. I know that I remember this grooved-out part—that was special. The piston we had in the six-cylinder Staver car having the Teeter motor was just about on this order right here, in 1911. It wasn't in the Staver six in 1911. This is a six-cylinder piston right here. This was in the Betsy model; this is 1913. But the 1911 was on this order, only a smaller piston. That piston is exactly, you might say, like the piston in the Betsy. That is a regular Teeter piston for the six-cylinder car in 1913.

Q. Look at those slots in that particular piston, Exhibit 3-V, and compare those slots with the ones that you said Mr. Monckmeier put in the pistons that he used in the Elgin race in 1911? A. I would say it was exactly the same. It was on the same order as this exactly, because when he was sawing this here I told him the thing wouldn't hold up.

Q. When you said "this here" you mean the vertical slot that goes through the hole? A. Yes, sir.

(Narrative continued) I said the slot was offset, it is a little here. I remember this wasn't straight, it was

just like this. You see this comes up here and then over this way a little bit, instead of coming right straight up. That is the reason we drilled a hole in here, so we could get the hack saw in here. Those holes were drilled in there; that was extra. They were drilled in there to lighten up the piston, take so much weight off of it.

I saw Gus Monckmeier last about five months ago. He didn't say nothing about the pistons. He said, "Anybody comes to you and talks to you about it, just don't tell them nothing." I knew at that time what particular piston he had in mind, because about seven or eight years ago, maybe more, I know he wanted to know if I would sign an affidavit for someone on the same piston. I think it was seven or eight years ago, some case was supposed to come up in New York or something. He wanted to know if I would sign it, and I said, sure, I would sign an affidavit because I knew just exactly what it was.

He didn't tell me what to testify to; he just asked me if I remembered the pistons, and I described it to him as near as I could; that is all.

I first met you (indicating Mr. Bruninga) about a month ago, I would say. You asked me about this piston, to tell you what I knew about it, and I did. I didn't tell you a different story than I have told you now.

It has been a good many years since I have seen a piston like Exhibit 3-V with the slots in it. I haven't seen—I think we had one extra piston, or one extra piston laying around the stock room like this one all the time for an extra one. I haven't seen the other ones for 15 years or so. I saw this extra one—that would be about—we moved about 1917, I would say we moved from there, and we discarded a lot of parts. We had an awful lot of parts in our stock room. Every time we moved from one place to another we would discard some; we didn't want to carry so many parts around.

I haven't the slightest interest in this case or in the outcome of it. I do not know who the parties are here in Cleveland that are sued, I do not know either one. I do not know anybody connected with Sterling Products Corporation of St. Louis.

Mr. Bruninga: That is all.

CROSS-EXAMINATION by Mr. Richey.

We junked the parts that the Staver Company discarded from time to time, sold them for scrap iron.

That piston like Exhibit 3-V, that I said was around there about 1917, had slots in it. That was junked. You see, I had charge of the stock room. When the carriage business went out of business and sold it to the Staver Motor Car Company, we bought, oh, gosh, I don't know how many carloads of parts, you know, frames and fenders and motor parts, and we just had two big stock rooms, and we had the establishment piled up with rear axles and axles and radiators, and one time I discarded parts that weren't sold, back for 1915 or '16 parts, that we didn't sell, we just discarded. In 1914 when we organized the Staver Motor Car, we moved in another department of the Staver Carriage Company, we moved this stuff, and we didn't want to keep it, so stuff that wasn't salable I just threw them away.

I said that after the company quit assembling motor cars, it went into the service business, that is, they supplied parts for cars they had assembled. We supplied the pistons as substitute parts or repair parts during that period. We supplied pistons for Tester motors. None of them were slotted.

The time that Mr. Monckmeier took the pistons out of that four-cylinder racing car before the Elgin races in 1911 and slotted them and put them back in, that is all he did to those pistons at that time, but we did change the rear axles and put in different kind. The rear axle was changed before the race. We didn't have any trouble with the axle, but had trouble with the motor.

Between the time the car came back and the time it was used in that bowl, we took the pistons out that had been slotted, and put in standard pistons which weren't slotted. Then we took the slotted pistons, all five of them, and put them in the stock room. They were laying around there for a long time because I had a certain place for the racing parts. You see, we figured if we did go into the racing game, we would build a six-cylinder car. The slotted pistons we took out were never used again. We built only the one car after that, the Betsy, and the pistons we put in there weren't slotted. Neither did we put slotted pistons in any other car that the company assembled. As far as I know the Tester Company never did. That is all I heard of this slotted piston until Mr. Monckmeier came to me a little more than five

years ago, about seven or eight, I would say, and mentioned it to me. At that time he told me "If anybody ever comes to you, just don't say nothing about it at all." He didn't give me his reason for not wanting me to talk to anybody about it. He said, "The only time you want to talk is when you get up on the stand."

Q. He contemplated litigation about it, then, because he contemplated you were going on the witness stand? A. He said, "You may have to go to New York." He said, "Some company is suing another, and you may have to go to New York on the case." He said, "Don't say nothing until you get on the stand, or explain anything." I said, "All right."

(Narrative continued) Gus Monckmeier prepared the affidavit for me. He wrote it up for me, and I signed it as he wrote it up. I have testified here in accordance with that affidavit.

Q. Who was it that drilled these holes in the Teeter piston that you used in that four-cylinder car? A. Well, my brother was a machinist. We had a machine shop there and my brother was the only machinist that we had, and he worked, I know he worked on an awful lot of those parts. He built motors, assembled motors, worked on the motors.

(Narrative continued) The Elgin race in 1911 was the only race I saw. I didn't inspect apparatus for the company. Gus Monckmeier was the experimental man on the parts; in other words, when anything special was up he had to take the cars, drive them around, see if they would hold up. That was his job. His recommendations were adopted by the company. You take a car, and if you have a special rear axle, he would take it out and see if it was all right and report what kind of condition the rear axle was in. We had trouble with the Salisbury axle. The Salisbury didn't hold up, so we finally used the Hess. The Hess seemed to be the better axle. Our company relied on Mr. Monckmeier to make those tests, and on his reports.

The attorney said that he would pay my expenses down here. I work for myself, buying and selling cars, wasn't doing anything. I told him I would come down if he paid my expenses down.

The Staver Company is still in business. I left them in 1930 to go to work for the Chicago Motor Club. I

worked there from November, 1930, to November, 1932, two years, in the service department, floor man in the service department, and the Motor Club was getting slack, so they were going to lay off a man that worked for 15 years and they didn't like to do that so they give him my job and let me out because I was one of the youngest ones.

Mr. N. E. Dexter was in charge of the Staver Company back in 1911, '12, '13, '14, and '15. He is still, he is manager. They call it the Staver Auto Service Company. He is still with them. He wasn't the manager until 1914, until they organized the new company called the Staver Motor Car Company. Mr. Roy Staver had been manager prior to 1914. He died about 1916. Before that we had so many men around there; Mr. Teeter at that time had charge of the experimental department, and Mr. Joe Lynn was, I believe he was the manager back from 1912 and '13. I think it was Ralph Teeter, I wouldn't say for sure. Some relation of his made the motor. I heard he was with some piston ring company, if I heard the name—Perfect Circle, I think he is with the Perfect Circle. I don't know what city.

I haven't seen Joe Lynn since 1914. I don't know where he is.

Mr. Monckmeier reported mostly to Roy Staver. He was one of the big shots there. Whatever he said there goes. Roy, and Harry, Mr. Harry Staver is president; he is still living today. I don't know whether Mr. Monckmeier ever reported this slotted piston to Mr. Staver.

These slots were cut in the pistons in the 1911 Elgin race car with a hack saw. I wouldn't say I saw them cut in there. I was in the stock room. The stock room was right next to the machine shop.

Q. You said something about Mr. Monckmeier telling you he burned out some pistons before this change in 1911. You didn't see those burned out yourself? A. No.

Q. All you know about it is what he told you? A. Yes. Well, I know they were burned out, later, because they brought them in and we had to tear the pistons out, but I didn't see them burned. I know they were burned out, though, scored.

(Narrative continued) That was about a week after the race. We didn't tear the motor down, just threw

them in the shed, and they had to use the men to get ready, to get the race cars going; after the race they began to tear these motors down. They burned the pistons out on time trials before the race. They didn't run the same motor in that race, they used a different motor.

I didn't see those pistons that were burned out when they made the motor; that was done at Hagerstown, Indiana, the Teeter Motor Company had built the motor. We didn't build them. I don't know what the clearance was.

Q. Between the time that the pistons were burned out—those motors were taken out of the car? A. Yes.

(Narrative continued) It was the same car that the slotted pistons were put in. When we put in the new motor we put slotted pistons in there for the race. The car had run before the pistons were slotted; it ran maybe six times around in the time trial, the same kind of run that the car was run on when these pistons were burned out.

The only car that finished in the race was Monckmeier's car. The others burned out. Well, the cylinders cracked on one, although I remember that distinctly. It froze up and the cylinder cracked. And on the other car, gosh, I know it didn't run, it was just froze up. I don't know whether they broke the block or anything on that one, but one of them broke a block, froze up solid, in other words, broke the cylinders. Gus's car was the only one that finished the race. I don't remember how many cars were in the race. Three of Staver's cars went into the race, and that was the only Staver car that finished the race. A lot of others finished, though.

The Betsy car finished in all of the races when it entered. We didn't race that in this race—that raced in a lot of these fair grounds. Monckmeier drove that for a couple of years. Mr. Monckmeier drove that car for us for a year before we sold it to him. We never had any trouble with the motor, had trouble burning out the bearings, nothing with the motor, cylinder walls, or anything like that sticking.

These racing cars are built so as to sacrifice everything for speed. It is kind of a special job. It is not very much different from the pleasure car. The only difference was this Betsy had a 45 frame, four-cylinder frame, which was shortened up, shortened it up about

two feet shorter, cut out a piece of the frame, because I had to work on that, and put a six-cylinder motor in, and had to shorten the propeller shaft. We did such things as bore holes in the pistons, sacrificed weight and the strength that went with it for the speed that went with the racing cars. The pistons, cam shaft and ring gears, that is the only three changes we made.

Mr. Richey: That is all.

GEORGE ELLINGHAM, a witness called by Defendants, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. Bruninga.

My name is George Ellingham. They call me "Red," they always did. I live at 543 Englewood Avenue, Chicago. My age is 42. I came to Chicago in the first part of 1911. I started to work in Chicago then, at Staver Carriage Company. I started the same year I came to Chicago.

The Staver Carriage Company, besides carriages, were assembling cars, automobiles. The car went under the name of "Staver." It was also known as "Staver-Chicago." They had that on the shield. That car had a Teeter motor in 1911, of four cylinders, and the bore of the cylinders was about 4⅜ or 4½; they carried the two sizes. I don't know the length of the stroke. It had a splash system of oiling.

The Staver Company had three or four racing cars in 1911—I couldn't say just how many. I knew some of the racers. I know Monckmeier and Ireland; I didn't know Ireland as well as I know Monckmeier. Ireland was a racer in 1911. Mr. Monckmeier of whom I speak is Gus Monckmeier.

I attended the Elgin automobile races in 1911, which was a big race. I am pretty sure that was in the summer. No one was hurt at that Elgin race, but in the trial spin, Ireland was killed, preceding the races. He was the driver of a Staver car.

I was a machinist at Staver's in 1911, in the machine shop. My duties were bench work and lathe work and all around—drill press, shaper, they had, just a small machine shop. I was about 22 at that time. I had had about four years experience as a machinist before I came there.

I did some machine work for Gus Monckmeier before the races. I helped him saw a slot in the piston, sort of a T-slot he put in there. It was a cast iron piston, the same cast iron piston that was used in the car. That piston had wrist pin bosses inside there. That slot was sawed about a quarter of an inch below the lower ring, and there was a hole put in about half-way down, and the slot was sawed to one side and over on the other all the way through, sort of a zig zag slot. That made a T with the one on the top, just one T. The top of the slot was about a quarter of an inch below the lower ring. The down stroke of the T just went over to the opposite side of the hole, as though one to the hole was up on this side, and the upper one on this side (indicating). That slot went clear through the piston wall, as did the vertical slot. The vertical slot was between the wrist pin bosses. I helped Monckmeier saw that piston, right on the bench, right where I was working. I slotted four or five pistons, to my knowledge.

I wouldn't swear that that T-slot was on both sides of the piston. I am pretty sure it was. I just remember sawing—it was something new to me to see him do something like that.

I had seen these kind of trunk pistons like that in the Teeter motor before that time. I hadn't seen the ones with the slots, but just the regular pistons. I knew that it was a Teeter piston these slots were made in. I knew those pistons pretty well. I had seen quite a few of them. I am sure of at least one slot. I wouldn't say on both sides, but I am positive they were on one side because I remember that very well.

I asked Monckmeier the reason for putting the T-slot in, and he said for contraction and expansion, so if the engine would run hot, it wouldn't freeze in there. That was his idea in doing that. I asked him, and that is how I found out. After they were through racing, they took out the pistons and put them in stock some place. I never saw them after that. After we had slotted them, he put them in the motor. I saw him take them over and put them in the motor of the racing car. That was a few days before he was going to race at Elgin. You see, he used that car at the Elgin races. I don't know what became of the pistons afterwards. I don't remember of ever seeing them after that. I never paid any attention to that.

The Staver Company continued to build cars until about, I guess about 1914, when they went out of business. I left their employ about 1915.

The Staver Carriage Company changed its name into the Staver Motor Car Company. He wanted to put it all over in his name, I don't know how they did; I know they changed the name. I should judge that was a year or so before I left there. There was a six built later on by them, during the period I worked there. I think it was in 1912 we began building the six. That had a six-cylinder Teeter motor. I couldn't swear as to the size of the bore of the cylinders of that six-cylinder Teeter car. I think it was 4 or 4½, I am not sure.

I know about the car known as the Betsy. That was a racing car. Monckmeier bought and raced it himself. I saw that car. I think I did some work on it, I am pretty sure I did when he was building it. It was a six with a Teeter motor.

The piston Exhibit 3-V is the type which we used in the four-cylinder racing car, one like this. Only the slot wasn't as wide. We just had a hack saw.

I don't recall whether or not those ring grooves were used in the four or six-cylinder car.

The slots in Defendants' Exhibit 3-V piston are about the same as Gus Monckmeier and I cut in the pistons before the races, only this slot is down a little lower, and we cut it all the way through; that is just hanging on there on one side.

Q. You say this horizontal slot, then, circumferential slot below the ring land, it was a little lower down? A. About a quarter inch below there.

Q. You would say about a quarter inch lower than the ring groove? A. Below the ring groove.

Q. How about the vertical slot? A. That was just about like this, sort of staggered.

Q. How about the holes? A. The hole wasn't that large, only a half inch hole. I know it wasn't quite that large.

Q. Did you see any of the pistons that were used in the six-cylinder car that Gus Monckmeier took, or the Betsy? A. I have seen the pistons but I don't recall whether they were any different.

Q. I mean in that particular car that Gus Monckmeier took? A. In the four-cylinder?

Q. No, in the six-cylinder, the Betsy? A. No, I didn't see those.

Q. You would say then that the pistons that Gus Monckmeier used in the Staver car in the Elgin races were slotted the same as that Exhibit 3-V; is that right? A. Yes.

(Narrative continued) All the Staver cars didn't finish the race at Elgin in 1911; I am not sure; I don't know if they did. I do remember that particular piston. The reason I remember that particular slotting is because when I recall of sawing it I was wondering what he was going to do, such a foolish thing that I was going to saw the piston in two, that is what I thought when I started out; that is what made me remember it. I remember asking him about it. I was helping him. He was sawing it kind of crooked. I was kind of engineering to get it straight. He was always in a hurry for everything, you had to jump when he wanted something.

You got in touch with me through my brother, who told me to call you when you were at your daughter's in Chicago. That was just about a month ago, something like that. It was two weeks ago last Saturday, that is right. My brother phoned me. I was out at the time. He left word to me for me to call you as soon as I got in. A number was left for me to call you. When I called you you asked me what I knew about this Monckmeier piston, and I told you at that time what I knew about it. It was not a bit different from what I have been telling here.

I haven't seen Gus Monckmeier in 12 or 15 years.

My brother did not tell me how that Monckmeier piston was made. He just mentioned something about a piston over the phone and asked me if I knew anything about it. Then I thought for a minute and it came to me and then I called you.

I haven't seen that particular piston, Exhibit 3-V, at all before today, nor have I seen any photographs or drawings of it before today.

I haven't the least idea what parties are being sued here. I have no interest whatever in the outcome of the case. I do not know anybody connected with the Sterling Products Company, or the Ray Day.

My brother's name is Herbert Ellingham. He is in Clevelahd now.

Mr. Bruninga: That is all.

Cross Examination by Mr. Richey.

My brother didn't talk about or tell me about an affidavit he executed for Mr. Monckmeiver five or six years ago; he never talked to me about any of that.

We both live in Chicago. Sometimes I don't see my brother in two or three weeks, but on the average I would see him once a month, socially. We have not worked at the same place, nor did we five or six years ago. We do not live together now, nor did we five or six years ago.

My brother didn't tell me that five or six years ago Mr. Monckmeier came to see him; he never mentioned anything that I recall about these pistons I have been testifying about. He didn't tell me Mr. Monckmeier told him not to talk to anybody about these pistons; he has never said anything to me. I have not talked to him about these pistons in the last ten years. We came down on the train together. We talked a little about these pistons on the way, you know, just offhand. I didn't pay much attention, just told him what I thought.

I made my arrangements to come down here with him. We then talked over what we were coming for. We talked about pistons just in the last two weeks, when I knew I was coming down; I didn't know for sure. When we get together socially we talk over different things, but we haven't talked about this piston until recently. We talked about almost everything else. We talked about a lot of different things but never talked much about pistons or anything like that.

I used a hack saw blade when I cut the slots in those pistons used in the four-cylinder engine. When I used the hack saw blade on those pistons I put them in the vice, not a very strong grip on them, very little, with a shield so I wouldn't nick them up. We drilled holes in those pistons that we slotted, similar to those shown in Exhibit 8-V.

I don't know just exactly what the clearance was, in that four-cylinder car in which we used these slotted pistons, between the pistons and the cylinders. I don't know what clearance there was in the other cars, the regular cars made by the Staver Company.

Mr. Richey: That is all.

Re-Direct Examination by Mr. Bruninga.

I have told here in Court what I remember. My brother did not tell me what to say. He never had nothing to do with it. You told me to tell the facts when I

came into Court, what I knew about it, and when I go any place I do that.

My brother and I did not discuss all the details of the slotting, we just knew what we was supposed to come down here—we never discussed anything about the details of the pistons. He didn't tell me anything, nothing about that.

I said my brother and I came down here on the train together. I didn't get the question. We drove down.

Mr. Bruninga: That is all.

(Adjournment to following day.)

(At this point testimony of PERFLER, Record pages 273 to 274, was taken.)

(Thereupon, at 1:30 P. M. Thursday, February 2, 1933, the hearing was resumed.)

ROBERT W. D'VORSKY, a witness called by Defendants, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. Bruninga.

My name is Robert W. D'Vorsky. I was born in 1892. I am engaged in the manufacture of airplane propeller type fans, electric fans in the city of Chicago. The name of my company is "Super Air Screws." I am a partner in the firm, partnership.

My general education after graduating from school, is one year at the University of Iowa, in just the liberal arts.

I know Gus C. Monckmeier. I think his home is in Davenport. His business is in Rock Island, Illinois; I believe his home is in Davenport now. I first met Mr. Monckmeier in San Anton, Texas, in 1912. He was there to race an automobile at the races being put on there at that time. I was there with a partner, we were selling magazines at that time, and the way we became interested in these races is through a fellow we met in the hotel, and that way I met Mr. Monckmeier. Mr. Monckmeier drove a Staver car in that race. That car was being manufactured in Chicago. Though I found that out later, I don't remember of knowing it at the time. I would say it was a year later, when I called at the Staver factory in Chicago. At that time I saw the Staver car that Mr. Monckmeier had, which was a bigger car than he earlier had in San Antonio.

That car I saw at Chicago had six cylinders. I saw Monckmeier off and on after that; I would see him once in a while running in a race. I saw Monckmeier in 1914. I don't remember clearly where I saw him first in 1914. I think I remember of having seen him somewhere in some races, but the time I do remember distinctly was at Iowa City, Iowa, early in the fall of 1914. Iowa City was my home town, and my oldest brother was helping promote an automobile race there, and he had asked me to come back to handle the advertising for them. I went back to handle the advertising in 1914. As I remember it, I was told Monckmeier was in Iowa City at that time reconditioning his car, and was told at what garage he was there, so I went down to see him. Sidwell's garage was the name of it. I found at that garage that Mr. Monckmeier had his car pretty much dismantled, and just generally reconditioning it, everything; spent quite a little time on it, and I helped him some reassembling the parts. That was a Staver six car that I first seen in the Staver factory at Chicago. That car had the number nine, I remember very distinctly. I remember the general appearance of that car and would recognize a picture of it.

The postal, marked Defendants' Exhibit 4-P, is a little hazy, but the second car behind is the car that I saw in the garage. I can see that number nine on that car. That is a Miles City boy in the car, a great friend of mine. Sam Wilson was his name. He was in that Iowa City race. I didn't see all of that race, because I was busy with things that required my attention so I couldn't watch the race steadily. At that Iowa City race I was up in the judges stand part of the time and helping in various ways. I had the program concession and I had to be checking in the boys and sales.

Referring back to the garage where I saw Gus Monckmeier's Staver number nine partly dismantled, I particularly saw the pistons we put back in the car at that time. They were aluminum and there were six of them. The head of those pistons were concave. I remember that there were a series of holes, round holes, around the skirt of the piston, and then the slots, sort of a T-slot cut into the piston. You see there were two T-slots, one on each side, at right angles to the head, but I don't recall that perfectly, that they were right at those angles.

I never heard the expression "thrust face of a piston." I know what the wrist pins of a piston are, and I know how they are arranged in a piston. The wrist pin

bosses that carry the wrist pins are arranged horizontally in a piston. I didn't notice any particular difference between the way the wrist pin was arranged in those pistons and any other piston, the location of those rings in it. The general location of a wrist pin in a piston, I would say, is about half-way up the piston.

The horizontal of that T-slot I was talking about was at the top—not the top of the piston, I mean above the wrist pin holes. It was below the ring grooves. The vertical of the T was at right angles to the grooves. I wouldn't say it was exactly in the middle of the horizontal slots, but as I recall it it was practically in the middle. I am not sure how far the vertical slot went down toward the end of the piston. It went into, as I recall, into one of these round holes, which were about, I would say, half an inch or three-quarters of an inch in diameter, and then I don't remember whether it was a continuation of that line that went to the bottom of the piston—it seems it was more of an offset.

Q. It was an offset, but did the slot that ran up and down, did that stop altogether then at one hole?

Mr. Richey: I object. He said he didn't remember.

Mr. Bruninga: Question withdrawn.

(Narrative continued) I think I can draw how that T-slot looked, on a piece of paper. (Witness makes sketch on paper marked Defendants' Exhibit 4-Q of what he remembers of that piston and the way the slot was arranged.)

Q. Now, will you locate on that just about where the wrist pin line would be? A. (Witness complies.)

Q. How about on the other side? A. (Witness makes further sketch.) This may be made a little longer in proportion to the width of the piston.

(Narrative continued) 1 represents the wrist pin holes, 2 is a ring groove; that is a separation between, ring groove. 3 is the top line of middle ring groove. 4 is the horizontal slot of the T. That went all the way through the side wall of the piston. 5 represents the vertical slot hole. 6 represents one of the holes that were —there were several of them around the skirt of the piston. 7 represents the vertical slotted hole, again.

The slot 5 went all the way through the wall. 7 also went through the wall.

The line 8 represents the bottom of the piston. It is my recollection that the slotted hole 7 went all the way to the bottom of the piston as I have shown it. That piston is the one I saw in the garage in the fall of 1914 in Iowa City. I think the pistons were on the bench when I first saw them, but I am not sure of the exact location. I think they were all out of the motor. I believe there were six, but there may have been more than that. I know there were at least six. That was before the Iowa City race. Those pistons were put back into the motor. I helped a little bit on that motor. I don't recall so clearly if I saw them put back into the motor or not, but I was there when the assembly was made. I remember the difficulty that Mr. Monckmeier had assembling the pistons and putting them back into the cylinders.

Monckmeier used that car in that Iowa City race. Monckmeier saw that I noticed those pistons. We discussed it.

Q. You discussed it. What did he tell you, if anything, about the pistons in that discussion?

Mr. Richey: I think that would be hearsay.

Mr. Bruninga: Oh, no, your Honor, this is an exception to the hearsay rule in patent cases because it is a question of disclosure.

Mr. Richey: Well, I think if you limit it.

(Narrative continued) Mr. Monckmeier answered several questions I asked him about the pistons, because that was so unusual that I asked a lot of questions. He said he wanted more flexible and lighter reciprocating parts to do it, for he would get better performance, higher speed from his car. Mr. Monckmeier didn't explain any too much in detail, any more than answered the questions that I asked, because I was so interested. I don't recall that I saw those particular pistons after that time, although I do recall seeing Mr. Monckmeier working on his car the following season, with the motor down, but there was nothing then to make me pay much attention to any one part of this at all. I have never seen any of those pistons since that time. I have seen no pictures of them. I have never discussed the construction of those pistons with anybody. You asked me to tell you how they were constructed, you didn't tell me. I believe I would recognize one of those aluminum pistons if I saw it.

Q. Well, here are a bunch of pistons on this table, about twenty-some of them? A. I believe that is the piston (indicating Exhibit 3-W).

Q. You believe that is the piston. How about the T-slot in that piston, is that your recollection of how it looked in the piston that you saw in 1914? A. Well, it wasn't quite that crude.

(Narrative continued) I didn't recall it was that way, but that looks like the piston all right, one of the originals. That head I remember very distinctly. I remember those T-slots were placed like that in that particular piston that I saw. I do not remember positively about the piston rings in that piston. I believe he had two rings in this groove, in the lower groove, though that seemed to have—no, that is cut away. I do not know that the make of that particular ring is in that groove. I don't recall the rings clearly, but I had the impression they were narrow rings. As far as my memory goes, that is one of the particular pistons that I saw in the garage.

I was following automobile races after Decoration Day, 1915, until the end of the season. We started in Coffeyville, Kansas, and then we worked into Missouri and Iowa and Minnesota, some in western Illinois. I met Monckmeier frequently that year. In most of those races in that territory, I handled the advertising or program concessions; others I promoted the races myself. Monckmeier was driving the Staver car; still Staver number nine, the same car. He was driving in those races.

There was a race at Anamosa, Iowa, during 1915. I believe it was around the 4th of July, it wasn't late in the season, I know. Monckmeier ran that Staver number nine car at that race. There was a motorcycle rider that was injured at that race, and I believe he died after that from his injury, though I am not positive of that. There were motorcycle races preliminary to the automobile races in Anamosa.

I have heard of a man by the name of Lyon who drove a Ford special. I believe he drove in that Anamosa race, though I couldn't say positively. I know he was there. I know a man by the name of Phil Shaffer who was also a driver in that race. He drove a Chevrolet.

Frequently there would be an occasion when the hood on Monckmeier's car would be raised on the track for minor adjustments, where we would all look, of

course. He didn't use a fan in his car at that time. I never saw him get stuck on account of the pistons seizing.

Those races in Iowa were not sanctioned races. They were called non-sanctioned races. By that I mean the three A's ruling on eligibility rules were not observed by the promoters of these races, or the drivers that run in them. They were more just like "wildcat" races.

Part of 1916 I was selling Chalmers cars.

Monckmeier's piston with the T-slot was discussed in the presence of Mr. Monckmeier with others at different times. In 1916 the Chalmers cars had aluminum pistons in them, and I remember discussing that with one of their engineers, that this car had been equipped with these pistons, slotted, a couple of years before that time. I don't remember distinctly whether I went into details on how that slotting was done.

Mr. Bruninga: I want to mark for identification a photograph of the front page of the Anamosa Journal, Anamosa, Iowa, dated Thursday, June 10, 1915, which contains a report of this race that the witness has been talking about. The same is marked for identification Defendants' Exhibit 4-R.

I would say Monckmeier was frequently in those races in 1915. I would say he won money in a majority of races, a big majority of races.

(Short recess taken.)

I have never seen the Anamosa Journal, Defendants' Exhibit 4-R, before you introduced it here. I don't think I have seen any Anamosa Journals since perhaps in 1915; I don't know for sure. It is a small town paper. I didn't take much trouble reading small town papers like that.

When you talked to me about this matter and tried to find out what I knew about these things, I gave you the names of Lyon and Shaffer when you asked me who was there. I told you what kind of cars those men drove.

I don't recall that I ever saw any of Monckmeier's cast iron pistons.

Q. You saw this particular piston here, Exhibit 3-V, on the table, didn't you, and you didn't pick it up at the time you picked up 3-W? A. Yes. Their position is moved now. I didn't see the bottom of that piston before.

Q. Well, you might examine that 3-V, which is an iron piston. Can you tell me now whether you saw any of Monckmeier's cast iron slotted pistons? A. I don't believe I ever did.

Cross Examination by Mr. Richey.

As to the length of time I followed these automobile races, the first one was in 1911—or '12, and the next one in 1913 in California, and then after I got back I don't believe I had any connection with any races until in 1914, perhaps two or three was all that season, and then the entire season of 1915, and then after that I dropped out of racing. After that I went into selling automobiles, and advertisements. The only car I ever sold was a Chalmers car. I started selling that some time in the spring of '16. I believe I sold that car until the early fall of that year around Iowa City, my home town in Iowa.

After I discontinued selling cars, I started selling advertising again. I got back into the automotive line, tools, selling tools in Providence, Rhode Island, in 1917, and went into the service.

I have not been connected with the automobile business since 1922. When I returned from the service my health was poor; I was inactive for those first three years except for selling some tools. I sold some that this fellow Monckmeier manufactured, and then others that were manufactured by my former connection at Providence. I saw Mr. Monckmeier when I was selling those tools. I would say I sold for Mr. Monckmeier from 1920 to '22. After '22 I engaged in the manufacture of ventiiating fans. I kept that up until about two years ago, I started in business for myself making fans.

After 1922 I very seldom came in contact with Mr. Monckmeier. I don't believe I saw him over two or three times since then.

I don't recall the name of the man with the Chalmers Company to whom I spoke about aluminum pistons. The Chalmers car at that time was equipped with just a solid wall aluminum piston. It was something like Exhibit 3-H, except it was of aluminum. Those pistons had been giving us trouble is the reason we discussed it; they gave a lot of trouble pumping oil. The factory engineer's calls down there were more or less general. I don't believe that he came there particularly on account of that trouble; as I remember it he was inclined to of course maintain that the car was all right. We reported the trouble to him that we had been having. Our customers had been complaining about it. I remember mentioning to this engineer about this slotting of the Monckmeier pistons, that Monckmeier used an aluminum

piston that he had full of holes in the skirt and slotted. He didn't seem to be impressed by it, at least, just casual. Nothing was said about it that I know of, because I left the company shortly after that. I don't recall definitely whether they continued to use this trunk type piston or not. I recall something was done in the refinement with lynite, and so that they had some of those troubles eliminated. I don't know whether or not they went back to the iron piston. I don't think they did.

I knew later of the use of the split skirt piston. I have known for some time that that use was quite general.

I met Mr. Monckmeier at San Antonio, Texas, in 1912, in the fall. I don't recall accurately what month. I presume it was about September or October. I am not positive that it wasn't November. I know shortly after that—I know we landed in California on Christmas Eve, in Los Angeles, and we made a few stops in between. I don't remember exactly whether or not it was warm in San Antonio at that time. I don't think it was anywhere near freezing.

The race in Iowa City that I spoke of was in the fall. I wouldn't remember what month exactly. It seems it was Labor Day that this race was held, but I wouldn't be positive of it. I don't know exactly how many cars were in that race. There were usually about six or eight cars entered, the number varied. I don't recall how many races there were; usually about four—three races. Monckmeier usually took part in just one race. I don't know which one particularly. They usually had a light car race and a heavy car race. I know Monckmeier raced there at different times beside that, but I don't recall how many he participated in at Iowa City.

The money prizes in those races depended upon the promoter and the length of the race; sometimes there would be three moneys, four. When I said Monckmeier was in the money, I meant he was high enough to get some part of the money, just like you say a horse gets a ribbon, but it may get a yellow ribbon.

I don't recall definitely when I talked with Monckmeier about this piston, but I remember one time when Monckmeier said he wished he had done something about that slotted skirt on his piston; that is about all that was said. He asked me to give him an affidavit about it at one time; he asked me, if I remember rightly, over the phone, and then I never met him to even talk about it

afterwards. He did not ask me not to tell anybody about it. He was not very talkative about the piston when I saw it. He was inclined to keep the information about it to himself; he answered my questions reluctantly at first; he didn't elaborate it much.

I don't know what the clearance was between the pistons and the cylinders in his car which I saw at Iowa City. I think that was a Teeter motor used in that car; I am not positive of that, though. It is pretty hard to remember these things all these years. I don't remember what kind of a magneto was used on the engine.

It wasn't common at that time for racers to use no fan on the motor. It is not necessary after they get going, to use a fan. The other drivers wanted Mr. Monckmeier to use a fan because he smoked so much. The engine that he ran with those pistons in it smoked a lot, and they always protested; they stand so close. The smoke from his exhaust was very bad, so that there would be foggy air around the judges stand and other cars, and the drivers complained about that fog being hovering there when they came around to the next lap. It reduced the visibility, and they claimed it increased the danger of driving. I saw the smoke myself; that argument came up quite often. The other cars didn't smoke that much.

I don't know whether or not it became common practice after that for the racing drivers to leave the fan off, because I didn't follow racing enough to check on those details, after that. There seemed to be a difference of opinion at that time as to whether or not a fan was needed. The speed of the cars in those races depended on the track. I would say a good average speed for the races I saw was a mile a minute. Some drivers considered the fan a useless complication on these old cars at that speed. Monckmeier apparently considered it such, for he refused to put one on.

That engine that Monckmeier had in his car had a big cylinder as compared with pleasure cars and those that have been used since.

Q. And when you looked at the pistons on the table there, there were only two pistons of the size that were used in racing cars of the day that you speak of, that is correct, isn't it? Want to see them again? A. Well, no, they were all sizes; some of them were smaller pistons. Of course that car of Monckmeier's, that Staver, and Stutz cars, those had big pistons, but the Buick and some of those—

Q. Well, on the table, when you picked out these, there were only two pistons of the size that were used in Monckmeier's car; that is correct, isn't it? A. I didn't check the sizes very carefully.

(Narrative continued) All the rest of the pistons look to be smaller. Monckmeier's car had unusually large cylinders, although there were some that had larger cylinders than that. One was the Sloan's bunch, Alex Sloan, he had a car, a J. I. C. built by the J. I. Case Company for advertising purposes; it had cylinders much larger than that one. The first one was a four. I don't know the bore of that Monckmeier car. I know the Stutz had a 4¼, I think, bore. Some of them were rebored larger, of course, for racing purposes. I don't know off-hand any others. The Ford, as I recall, was 3¾" bore at that time. I believe the Chevrolet was a sixteenth smaller, something like that, I am not sure about it. The Buick was smaller than the Monckmeier car, and also the Hudson was smaller.

I arrived in Cleveland early this morning.

I don't know definitely how many of the races at the Anamosa meet Mr. Monckmeier participated in, but I presume one; I don't remember. They were racing quite frequent, some programs would call for two or three races, sometimes shorter races, each class.

I don't remember how the wrist pin bosses were connected to the other parts of the piston in that Monckmeier aluminum piston that had a split skirt. I don't remember how they were connected to the head. I don't remember whether the skirt was uniform in thickness from the bottom up to the head, or whether it varied in thickness. I don't remember whether the round holes in it were all of the same size or different size; that is too much fine detail. All I remember, I know there were a series of holes there, and that is what attracted my attention to them in the first place. I do not know how the slots were made in that piston; they apparently were sawed. I wouldn't say they were as smooth as sawed slots. If handled carefully, a saw generally makes slots with smooth sides.

In metal, I believe you could saw smooth or rough, depending on your skill. A metal saw is the same as a wood saw, it has a lot of teeth on the bottom and smooth sides. I wouldn't say that when you saw a slot with a wood saw you always get a slot with smooth sides, whether you saw straight or crooked. I have sawed a

slot with a saw that had irregular sides. The redressing over the edge will make some irregularities if it is not done real carefully. Sawing in metal is not particularly different than sawing in wood, so far as the size of the slot is concerned.

I didn't examine all of these pistons, that had the slots in them, carefully to make sure they were all exactly alike. I was too interested in the general differences that I noticed. I don't recall if I helped to put them in the cylinders; maybe I did. I am positive that some of them were put back in the cylinders while I was there; I don't remember if all of them were, but I remember hazily some difficulty he had in getting those pistons back in. I don't think he put them back in all by himself, but I am not positive of that, either. I have forgotten his motor, whether they were put in from the bottom or from the top; I don't remember if they were put in from the top or bottom.

Q. But when I asked you you tried to figure it out by remembering what kind of a motor he had, and how they would be put in in a particular type of motor? A. That is too much of a detail to remember.

(Narrative continued) I am pretty sure the connecting rods were on them when they were put back in the engine; I am not positive of that, however.

I do not know what kind of rings were on the pistons. I am not positive whether the rings were cut on a bias, circumferentially. As I said before, I thought there were two rings in that bottom slot, but I have no way of recalling that definitely. I don't remember whether or not there were any ribs in the head of the piston. I remember the head. I remember asking Mr. Monckmeier if that metal was sunk in the casting. I don't remember what his answer was to my question on that, but it had some advantage. I have forgotten what he said about it.

The purpose of these drivers making the changes all the time in the cars was to secure a little better performance. What they meant by performance was power, which meant sustained speed. They were looking for parts that would stand up and keep running.

Q. But they had to have great power when they were running to get more speed, didn't they? A. Well, I don't know how to answer that question. Some of them had, theoretically, a lot more power than others, still they weren't capable of going as fast.

(Narrative continued) I don't remember how long that Anamosa race was; these feature races were usually 50 miles, sometimes they would have a 100 mile race, but not so often on a half-mile track; sometimes there would be just 25 miles. They tried to make them shorter, but sometimes the promoters would insist on the longer races. I don't remember how long the race at Anamosa was that Mr. Monckmeier took part in. I don't remember how long the next race was; I didn't know there was a next one. Usually the race Monckmeier was in was the last race of the day. That was a heavy car and the longest race and most money up.

I don't know what caused this Exhibit 3-W to be crushed in on one side and broken in on the other. I have heard of pistons breaking in a race. I don't know how they break in the races. They break in different ways; flaws in them; if they seize something has got to give. I don't understand the rule of breaking.

The slots which you have just shown me do not look like saw slots. They made those irregular like that in order to get started.

Referring to the pistons I saw at Iowa City, I don't know what the outside of the skirt below the ring looked like; I wouldn't know that; I wouldn't remember. The impression I had was that the vertical slot ran into one of these round holes, and then the part on the other side of the hole was offset from it and ran into the hole. I have a dim recollection of Monckmeier telling me that it was off to the side intentionally for some purpose, but I don't remember it exactly, what it was. I don't remember of asking why he ran it into the hole; he didn't explain much that I didn't ask him.

I don't remember if those pistons had webs on the inside. I don't remember if there were any grooves on the inside of the piston; I don't recall the inside at all, or any fine points of it, its detailed construction.

I don't recall whether or not the bosses were curved into the inside of the skirt. I don't remember how the holes were arranged in that piston; I don't remember whether or not they were arranged in rows, circumferentially.

I have been here this morning with Mr. Bruninga and Mr. Sutherland, and have talked this matter over with them.

I said the upper part of the vertical slot went into the hole on one side, and the lower part went off on the

other side. That doesn't seem to be true of Exhibit 3-W; that is just the impression that I had of it.

Q. Now, there is a jag in the slot, but it looks like it was made by twin borings or two borings of the tool, and then the only hole in the piston that connects up with the slot is near the bottom of the piston, isn't it, and the slot is there, what you might say tangential to the hole; that is correct, isn't it? A. Yes.

Q. Goes along one side of it? A. Yes.

(Narrative continued) I didn't mean to say definitely the pistons were on the bench there in the garage at Iowa City. I just presumed they were. I knew some were loose. I first noticed those holes in them and started asking questions because I had never seen anything like it. It was the holes that first attracted my attention to it. I don't know how long I was in the garage at that time, exactly. Monckmeier was there for several days and I would drop in and see him often. I think it was about 1920 or so, somewhere around there that Monckmeier said to me that he wished he had done something about this slotted piston. I believe it was after 1920, too, because I believe we were discussing a Maxwell car that had a slotted piston in it. I remember something about a car using a slotted piston. Of course they had no clearance as shown in Exhibit 1. I don't have just that offset, I don't remember those offsets being used that early. He said he was sorry he had forgotten about this thing and thrown it away and abandoned it, in view of the fact he had seen this Maxwell piston, or words to that effect. I think that was at the time he was still experimenting with a composition piston. He had, I remember one time he had various metals—aluminum alloys and he had a, I think a bakelite. I presume he was trying to get a light piston that wouldn't slap or stick; I don't pay much attention. I wasn't very interested in it.

Mr. Monckmeier was manufacturing some tools that I was selling for him, with other lines, but I don't recall just at that time that we discussed pistons. I just remember it was discussed sometime after; it may have been. He showed me some of the composition pistons he was working on, told me he was working on more in his shop there. I believe they were trunk type pistons. Of course that term excludes some of those others. I don't know the limitations of this truck type—does that mean without this offset?

Q. Yes, it would mean what you might call a piston that was truly cylindrical? A. Well, I couldn't say that positively.

Q. Well, at any rate the improvement he was trying to make in them was through the composition, as you understood? A. Well, I don't know that, either, positively because I wasn't very much interested at that time. It was a newer development of pistons.

Mr. Richey: That is all.

RE-DIRECT EXAMINATION by Mr. Bruninga.

Both you (indicating Mr. Bruninga) and Mr. Sutherland talked to me today before I came on the witness stand. I came into your room at the hotel about 9:30.

Q. And when Sutherland and I talked to you about the piston, what were we trying to do,—find out something or tell you something?

Mr. Richey: I think that is objectionable: asking for the witness' conclusion.

A. Well, you asked me questions.

(Narrative continued) You did not make any statements as to what you wanted me to do when I got on the witness stand with reference to testifying. You told me not to try to testify on those points I wasn't clear on, that I wasn't expected—that was too far back; I couldn't recall all of those things. Neither you nor Mr. Sutherland showed me any pictures or pistons.

I have no interest whatever in this case; I don't know yet what it is about.

You (indicating Mr. Bruninga) asked me to come here, and you said you were willing to pay my expenses. You did not promise me anything at all.

I just moved my factory into Chicago from Rockford, Illinois. I make airplane propeller type, aluminum casting fans; it is not like an ordinary electric fan; it has blades that look like an airplane propeller, four blades.

Piston inserters was the name of one of the tools Mr. Monckmeier was manufacturing at the time I sold some of his tools. These were used for inserting a piston into the cylinder block, motor block. Another one was a ring inserter for getting the rings onto the piston.

I don't recall that there were any accidents at that Iowa City race. Outside of the young man whose pic-

ture is in that exhibit, I remember another man in that race by the name of Sig Haugeahl.

I think that race was around Labor Day, 1914.

Previous to 1914 I had been in Chicago, Illinois mostly. I was selling advertising at that time more than anything; there weren't so many automobile races that year. I quit race promoting in the fall of 1915.

I saw these pistons of Monckmeier in the fall of 1914, before I went into the automobile business and quit the racing business. I saw those pistons before the Anamosa race in 1915.

I don't remember how long ago I was asked for that affidavit. I think it was about ten years ago or so. Mr. Monckmeier was not a very talkative fellow in 1914 and 1915.

The smoking of Mr. Monckmeier's engine did not continue throughout the race; it quit after his motor warmed up all right. Apparently it depended on how much it would run up or how long he had to wait before the race actually started, and some times before he was going around on the half mile track; it would quit that excessive smoking; nothing definite about the exact time.

When I saw those pistons in that garage in Iowa City in 1914, I first thought of those holes; then I picked it up and saw that concave head. I had never seen anything like that, so I wanted to know why. I mean the round holes; they all struck my first glance, of course. I also had never seen anything like the T-slots, and I asked him why he did that.

When I saw those pistons in 1914 at Iowa City, like Exhibit 3-W, they were all in good condition then to put in the motor, and one side was not smashed like in 3-W now.

Mr. Bruninga: That is all.

Re-Cross Examination by Mr. Richey.

The smoke I saw come out of that car was blue smoke, I guess. The cause of that blue smoke would be excessive burning of oil that is pumped into the cylinders by the pistons. When that car was running, that smoke would spread over considerable territory as against when it was standing still.

Mr. Richey: That is all.

RE-DIRECT EXAMINATION by Mr. Bruninga.

Of course if the car was to stand after he got going while his motor warmed up, his smoking would not be as excessive as it was before he probably warmed up his motor, apparently. As I say, after he got going fast, that smoke would be distributed over more territory; it wouldn't be quite as noticeable. It was very little different than any other of the racing cars after he had gone a few laps. They all smoke some, all cars, even after they have gone a few laps. After he was going awhile, I don't think he was any different than the most of them; their complaint was at the first.

Mr. Bruninga: That is all.

(At this point testimony of PERPLER, Record pages 275 to 292, was taken.)

WILLIAM M. VENNER, a witness of lawful age, being duly produced, sworn and examined, testified in behalf of defendants, as follows:

DIRECT EXAMINATION by Mr. Bruninga.

My name is William M. Venner. I am forty years old, and reside at 5631 Pershing Avenue, St. Louis, Missouri. I am employed as salesman by the Furnace Oil Corporation, selling Kendall motor oil.

I went through grammar school; had two years in high school and two years in the Syracuse Technical School, of Syracuse, New York, at night. After I left school I went to work for the H. H. Franklin Manufacturing Company, Syracuse, New York, in October, 1907. I was with the Franklin Company until December 30th, 1915. After I left them, I went to South Bend, Indiana, and with some other parties opened a Franklin agency on January 1st, 1916. I was in South Bend, Indiana, until May, 1920, when I came to St. Louis and took over the Franklin agency, with two other partners. I had the Franklin agency here a little over ten years, and after that we were still in the automobile business, up to December of last year, handling other makes of cars.

At the Franklin Company I started as a stock room boy and helper in the engine assembly. Then I got to be helper, assembling motors; then I got to be a full-fledged motor assembler, and then I worked in the repair shop

part of the time; worked in the test shed part of the time, testing, in the experimental room; had charge of the motor noise department; charge of the experimental laboratory, for a time, and then I was on the road, approximately, for three years, for the service, engineering the sales department.

I know Elmer C. Long, and first met him at the Franklin Factory, Syracuse, New York, the latter part of March, 1916. I was married on April 8th, 1916, and it was shortly before I was married that I saw him there. I came back from South Bend, Indiana, where I was located at that time, and was in Syracuse either two or three weeks before I was married. I met Mr. Long when I was going into the door, leading to the experimental room, and he was coming out with Mr. Stellman. Mr. Stellman, I believe, had the title at that time of Assistant Chief Engineer of the Franklin factory. His first name is Louis; Louis M. Stellman, and that was at the Franklin factory, in Syracuse. I remember what happened at that first meeting with Mr. Long. He showed me a piston that Mr. Long had gotten up.

Mr. Richey: I object to the part of the answer that says "Mr. Long had gotten up," as being hearsay.

Mr. Bruninga: He showed you a piston, did he?

(Narrative continued) Yes, and I remember what kind of a piston it was. It was an aluminum piston, with six vertical slots in it. The two sections on the opposite sides from the wrist-pins were separated entirely from the head, and were supported from the wrist-pin bosses by two struts. I was familiar with the standard trunk pistons at that time and would describe it briefly as being about the only type of piston I had ever seen up to that time, that was any different than the regular piston which was in use; the skirt was an integral part of the head, without any slots or separation of any kind. This was not the Long piston, but pistons I had seen prior to the time I saw this Long piston.

You (Mr. Bruninga) asked me to prepare a drawing of the piston that I saw and you gave me a drawing of a standard trunk piston and asked me to show in what way the Long piston that I saw differentiated from the standard trunk piston. I have made such a drawing and here it is.

Mr. Bruninga: The drawing is marked for identification, "Defendants' Exhibit A."

The figures No. 1 and No. 2 of this drawing show the standard trunk piston, without any alteration. The figures Nos. 3, 4, 5 and 6 show the Long piston, that I said I saw in March, 1916.

Briefly describing that Long piston, and placing reference numerals on the drawing, designating the various parts, the letter a represents the head of the piston; the parts b represent the ring lands, ring grooves; the parts c represent the wrist-pin bosses; parts d represent four side skirts that are separated entirely from the head; parts e represent the struts holding those sides to the wrist-pin bosses. These struts, e, are not shown in Fig. 5 because the boss is in the way there; they are in back of the boss. They could have been shown by a dotted line.

(Witness places dotted lines on drawing, as requested.)

The part, g, is a truss that was commonly used on lots of trunk pistons and standard trunk pistons at that time. The struts, e, were attached to the wrist-pin bosses as an integral part of the casting, and were attached to the part, d, in the same way. There were two struts in that piston; that is, there were two running from one side of the piston to the other. You might call it four, if you figure from the wrist-pin bosses.

The parts, h, on the drawing represent the slots. They went all the way through the skirt. Part i, represents a slot, and part j, also represents a slot, both of which go all the way through the skirt. The shaded part, k, represents an under-cut portion on the wrist-pin hole sides of the part that was fastened to the head of the piston. An under-cut part like this was found in a great many of the standard trunk pistons.

The standard trunk piston didn't require any bearing surfaces on that K side, and it was merely put there as a relief against expansion. The skirt in the Long piston was connected with the head on the wrist-pin sides, the wrist-pin hole sides.

I examined that Long piston in March 1916.

Q. State whether or not the piston that Mr. Long showed you, and that you saw in March, 1916, was constructed in the manner that you have described, with reference to "Defendants' Exhibit A."

Mr. Richey: I object to that as leading.

A. Yes, sir.

(Narrative continued) When I first came to South Bend, Indiana, the piston then used in the Franklin automobile was made of aluminum, or of aluminum alloy, like Figs. 1 and 2, Exhibit A, but it had four slots in the skirt, extending up about three-quarters from the bottom, three-quarters away from the bottom, to the bottom of the ring land, and it had an oil groove cut all the way around from the top of the skirt to the bottom, about one-quarter of an inch apart; the lands being about a quarter of an inch apart. This piston was like the one shown me, which is marked "Defendants' Exhibit B." It had those slots, as shown in Exhibit B. The purpose of that hole just to one side of the slot was to enable you to put the cotter-pin in the wrist-pin lock screw and to remove it, also. At the time it was first installed the piston used was just like Exhibit B. Later, my men and myself, who were servicing these cars, used to saw the slots up closer to the ring land, groove the lower inside edge of the skirt, and put a steel expansion ring in there. The steel ring came from the factory. We put the steel rings in, in the latter part of 1916, or the early part of 1920—sometime between those dates. A piston of the character of Exhibit B, with a steel ring, was used until the latter part of 1920. After that the Long type piston described in Figs. 3, 4, 5 and 6 (indicating) in Exhibit A was used. The Long type piston was furnished by the Service Department about April, 1920, and they were put in regular production about November, 1920. I can fix that date of April, 1920, when the Service Department put them in, because I got up the service bulletins we had, with the exact dates on them. I recognize Service Department bulletin, sheet No. 262, composed of two sheets. It is a bulletin containing information of interest to dealers, and contains an article referring to the Long type piston.

Mr. Richey: I object to any interpretation of contents of the document, by the witness, as hearsay. As to anything it says, the document itself is the best evidence, if it is relied upon as a disclosure.

By Mr. Brunings: The two pages of Service Department Bulletin, sheet No. 262, are marked for identification as "Defendants' Exhibit C."

The second page of this sheet bears the date of April 8, 1920. That sheet was received and read by me at that time.

Q. The second page of that sheet bears this notation: "Long Type Pistons. After April 15 the Service Department will be able to furnish Long Type Pistons in standard size. These are straight pistons with two or three thousandths clearance. Their weight is approximately the same as the standard pistons." Do you know whether the Service Department furnished those pistons after that date; after that date of April 8, 1920?

By Mr. Richey; That question is objected to as leading.

A. Yes, sir, (continuing narrative) immediately after; as soon as you could get your order into the factory they were available. We obtained some because we were very hungry for pistons of that type, and ordered them immediately, because we had so much trouble with the one that was in production at that time—Exhibit B. The make-up of those Long pistons that we were furnished then were the same as this Exhibit A here, in 3, 4, 5 and 6.

Exhibit C, which you obtained from me is one of my possessions. I kept a binder full of those bulletins, and I took that from my original binder. It was one of the originals that I received.

These two sheets of paper Service Department Bulletin, sheet No. 289, marked as Defendants' Exhibit D were obtained from me, and have been in my possession ever since I received it.

Q. This sheet, Exhibit D, bears the date of November 11, 1920: Did you receive this sheet before or after that date?

By Mr. Richey: I object to that as leading, and as asking the witness to testify to the contents of a document, which, if its date is material, is the best evidence of itself.

A. I received it a day or two after that date, probably.

By Mr. Bruninga:

Q. This sheet contains the following sentence: "All motors going through production at this time are being

fitted with this new piston known as the Long Piston and a more quiet motor with slightly increased ability is the result." Can you tell me from your own recollection whether at that time, or thereafter, Franklin automobiles were received by you having a Long piston?

By Mr. Richey: I object to counsel testifying as to the contents of an alleged bulletin, and object to the question as leading and improper; that the recollection of the witness has not been exhausted, and there is no occasion for producing the bulletin.

A. They were received by me about November, 1920.

By Mr. Bruninga:

Q. Can you fix the date at all, by the date of this Exhibit D, when the first pistons were received in Franklin automobiles, the Long pistons? A. Yes, sir. May I look at this (indicating Exhibit D)?

By Mr. Richey: Let the record show that the witness examines the paper, marked for identification as "Defendants' Exhibit D."

A. They were in production at that time, at the time that bulletin was printed.

By Mr. Richey: I object to the answer, as it has not been shown that he was in a position to know when the pistons were put in production.

By Mr. Bruninga:

Q. How were you in a position to know when the pistons were put in production at that time? A. Because we always received notification from the factory when the changes were made, and we could also tell by listening to the motor run, whether it had them in or not.

By Mr. Richey: The first part of the answer, based upon notification, is objected to as hearsay.

By Mr. Bruninga:

Q. Did you have occasion to tear down, or take down, any motor to examine whether they had Long pistons, at that time?

(Narrative continued) Yes, sir. Within a very few weeks after we received that bulletin we had one Long piston score, and had to remove it and replace it with

another one. That Franklin automobile had a Long type piston in it. There are so many things that we have to cause it, that it is hard to say what caused the scoring. The other pistons were all right. This happened while I was in St. Louis. The construction of those Long pistons in the automobile we had to tear down, was the same as Exhibit A, Figs. 3, 4, 5 and 6.

(Mr. Bruninga places before witness three pistons, marked for identification as "Defendants' Exhibits E, F and G.")

I recognize all of these pistons. F is the same type of piston that Mr. Long showed me in 1916.

Q. Can you tell me whether or not it is the same construction?

By Mr. Richey: That is objected to as leading.

A. Well, that is what my answer to the previous question was intended to be, that it was of the same construction that he showed me at that time.

By Mr. Bruninga:

Q. Do you know whether it had the groove underneath the lowest ring land all the way around?

(Narrative continued) I don't think that it did. I think the groove merely extended to the portion that is fastened to the head, like that shown in Exhibit A, Figs. 3, 4, 5 and 6. I used some Long pistons in automobiles before April, 1920, which, as I said, is the date I received Exhibit C. I think I received some of them from Mr. E. C. Long, and I am positive the major portion of them from M. K. Weems of Quincy, Illinois. I am quite certain I received some from Long, himself, in 1918; no, that is wrong—it was in 1917, because it was while the Franklin were using the pistons marked Exhibit B, here. Exhibit B was used in Franklin cars up to 1920. We received the first cars, with Exhibit B pistons in them, approximately in November, 1916, and shortly after that time, due to the amount of trouble we had with them, I started buying the Long pistons. I knew where to get them because I had already seen them at the factory, in 1916, and I don't know how the information came to me. Mr. Long was a Franklin dealer at that time, and I presume that is how I knew where to get them. I

knew he was a Franklin dealer, at that time, because, being on the road for the Company, I had a list of all the dealers.

The construction of the first Long pistons, that were furnished by Mr. Long, was practically identical with Exhibit F (indicating piston). It differentiated from it in that the little groove didn't extend into the portion fastening the wrist-pin bosses in the head. This is the groove in Exhibit F, which is just below the ring land, and it ran like in Exhibit A, Figs. 3, 4, 5 and 6. The first pistons were sand cast and had one rib on the inside of the head. I bought several dozen pistons from Long, before the Service Department began to furnish the Long piston. I bought some while I was still in South Bend, and they were constructed like "Defendants' Exhibit F." After I came to St. Louis I bought some pistons, and they were like Exhibit G, die cast. These were bought from the Franklin factory and from M. K. Weems, of Quincy. The Franklin factory was putting out pistons like Exhibit E, then. Exhibit D is also a piston the Franklin factory furnished.

(Here ensued colloquy among counsel concerning the identification of pistons indicated by the witness.)

(Witness' narrative continued) The proper answer to those questions is that Exhibit G was purchased from the Franklin factory, and Exhibit E from M. K. Weems, of Quincy.

By Mr. Richey (to the witness): You do not mean those identical pistons; you mean pistons like those?

By the Witness: The same construction.

By Mr. Bruninga:

Q. Did the first pistons that you bought from the Franklin factory have the oil holes and the groove just above the number 32313, in Exhibit G?

By Mr. Richey: That is objected to as leading.

A. No, sir.

By Mr. Bruninga:

Q. Do you know whether those grooves and oil holes were ever in the Franklin pistons? A. They were in the later ones.

By Mr. Richey (to the witness): He asked whether you know. You can say yes or no. I object to the answer as volunteering something.

(Narrative continued) I do not know the number of pistons, of the construction of Exhibit E, that were purchased from Weems, but there were dozens of them, during 1920, 1921, 1922. I bought a considerable number from Weems, while I was in St. Louis, and started buying from Weems immediately after I came to St. Louis, pistons like Exhibit E. I stopped handling the Franklin, in St. Louis, during the year 1929; I don't recall the month. In 1930 we ceased to handle the Franklin, and I gave up the agency. The Franklin automobile as furnished to dealers, particularly myself, continued to use the Long piston from about November, 1920, until about the early part of 1928. Then they used the Invar strut piston. I don't know what company furnished the Invar strut piston. During the time I used them, the Long pistons gave excellent service; much better than anything we ever had before. With the pistons, B, there was probably slapping when you received the automobile from the factory. With the Long piston, you seldom got a slap in that until you had from thirty to thirty-five thousand miles. This I know from experience, and it was true with the first Long pistons I obtained. Back in 1917, 1918, 1919 and 1920, I knew of no other piston that would give that service.

No piston was ever offered to me by the Aluminum Company of America, that would give that service, during those years. I never tested any pistons bought from the Aluminum Company of America, during the years 1917, 1918, 1919, 1920 and 1921.

No pistons were offered me by the Cleveland Trust Company of Cleveland, during the years 1917, 1918, 1919, 1920 and 1921. I have never heard of Edward J. Gulick, of Elkhart, Indiana. Elkhart is eighteen miles from South Bend. Mr. Gulick never offered me any pistons.

During the years 1917, 1918, 1919, 1920, 1921 and 1922, there was a great demand for a piston that would perform the service that the Long piston did, but I did not find anybody except Long that furnished it.

This bulletin, Franklin Service Bulletin No. 348, which is marked for identification as "Defendants' Exhibit H," which I previously gave you, was received by me in the mail, from the Franklin factory. It has been in my possession since April, 1922.

This bulletin, Franklin Service Bulletin No. 369, dated February 20, 1923, two sheets, marked for identification as "Defendants' Exhibit I," which I also previously gave you, has been in my possession since February, 1923. The Franklin Company was furnishing pistons of the construction shown in the first page of bulletin, Exhibit I, at the time I received this bulletin.

Mr. Bruninga: I offer in evidence "Defendants' Exhibits A, B, C, D, E, F, G, H and I."

By Mr. Richey: We object to the alleged bulletins, Exhibits C, D, H, and I, as incompetent and immaterial; and object to the statements therein as hearsay.

(Narrative continued) I am acquainted with George J. Oltsch, Patent Attorney, of South Bend, Indiana, and had business with him in April, 1920, while I was still in South Bend. He applied for a patent for me, on a split skirt piston.

Q. I hand you a certified copy of petition, specification, oath and drawing, as originally filed, in the matter of a forfeited and abandoned application of William M. Venner, filed April 12, 1920, Serial Number 373,340, marked for identification as "Defendants' Exhibit J": Will you examine it and state if you are the Venner named in that application?

By Mr. Richey: That is objected to as immaterial and as not related to any defense in the answer. I do not think it has been set up in the answer.

By Mr. Bruninga: Mr. Richey, you will find a defense in the answer, as far as that matter is concerned.

By Mr. Richey: Which one of the defenses is it?

By Mr. Bruninga: Two of the defenses are enumerated in paragraphs 40 and 41 of the answer.

(Last previous question read to the witness.)

(Narrative continued) Yes, I am the Venner named, and I filed the application. I recognize the sheet you have handed me, containing three views, in pencil, and containing on the back the word "piston" (marked for identification as "Defendants' Exhibit K"), as a drawing of the piston that I filed the application for a patent on. The sketch was one I made on February 16, 1920, the date noted thereon. I made some pistons constructed as illustrated in Exhibits J and K before February 16, 1920, the

date noted on the sketch, Exhibit K. The patterns were made by the Peerless Pattern Company, of South Bend, Indiana, and the castings were made in Cleveland, by the Aluminum Company of America, before the date of Exhibit K. When I received the castings I machined up about fifteen of them and put some of them in Franklin automobiles, at South Bend. After they were machined up, their construction was just like Exhibits J and K, and they were given a trial for several thousand miles of use. Their operation was fairly satisfactory. I didn't have any particular trouble with them, but in the first ones the webs extending from the head hole to the skirt portion were too light. I did nothing to remedy that, and in some of them the webs would collapse slightly. The web was between three-sixteenths and a quarter of an inch in thickness, made of lynite, an aluminum alloy.

That was the material that the Aluminum Company of America made the pistons out of. I specified in my order that they would be made out of Lynite, an aluminum alloy. The pistons were made in Cleveland, Ohio. I did not go any further with the piston because at the time I got it up I thought it would be better than the Long type, but it was not any better, so I just quit. I thought the Long was really better than what I had. The purpose of splitting the skirt of Exhibit B was to allow for the inherent expansion of the aluminum. This was not necessary with cast iron pistons, but it is necessary to split the skirt in an aluminum piston because the aluminum expands approximately three times as much as cast iron does, under heat. I knew this in 1916, and I also knew when that splitting would accomplish that, in the aluminum skirt. From my experience in this art, if I had any particular piston out of cast iron, and I wanted to make it out of aluminum, I would slot the skirt in order to have it function in a cylinder without sticking. I would say it was an obvious thing to do. I was familiar with piston rings in 1916, and they were split at that time. If I were given a piston of aluminum I would split it immediately under the head and down the sides, if it were possible to do it with the particular casting, and between the wrist-pin bearing.

"Defendants' Exhibit L," dated September 22, 1920, is a copy of a letter I received from George J. Oltsch, and I have a distinct recollection of receiving the original of that letter. I do not know where the original is now. I was in St. Louis when I received it.

By Mr. Bruninga: I offer in evidence "Defendants' Exhibits J, K and L."

By Mr. Richey: I object to all of them as not relating to any defense set up in the answer, and as immaterial as far as the Gulick patent is concerned, because they were subsequent to his filing date.

I object to the letter as incompetent, and to the statements in the letter as hearsay, and not sworn to, and the author is not produced for cross examination; further, the letter is not properly identified.

Cross Examination by Mr. Richey.

Aluminum or aluminum alloy is also lighter than iron—a couple of times lighter; it is also a better conductor of heat than iron, and conducts heat away from the explosion chamber faster than iron. I knew, a good many years prior to 1920, that aluminum possessed these properties, and that aluminum expanded about three times as fast as iron.

The Franklin car has always been an air-cooled car, and though I can't give you the exact date, since the Holmes car ceased to be in existence it has been the only air-cooled car in the country, and that has been a great many years. By "air-cooled" I mean the motor is air-cooled as distinguished from water-cooled.

Cast iron pistons had been used in the Franklin car before they adopted aluminum pistons. The main reason they changed from cast iron to aluminum pistons was because it cooled the motor better; the motor cooled better with the aluminum pistons; also, for the extreme light weight of them. It was desirable because an air-cooled motor naturally ran much hotter than the water-cooled. It was desirable to conduct the heat away more rapidly because we had trouble at times with the iron pistons scoring from the heat. That scoring did not take place until after the engine had been heated, because, with the iron piston they became so hot that it was impossible to lubricate them at high temperatures. It was possible to lubricate the aluminum pistons at the higher temperature because the motor ran much cooler with them in there. It did not reach the high temperature as it did with the iron. We didn't have any great amount of this trouble. The aluminum piston was not put in there entirely on account of heat. The Franklin Company had been having this trouble with the iron pistons before they adopted the aluminum piston, for about two or three years.

Another reason for adopting the aluminum piston in place of the iron piston was to obtain lightness of reciprocating parts; to reduce vibration and quicken acceleration. There were no other reasons that I know of for substituting the aluminum piston for the iron piston. This Exhibit B was the first aluminum piston that was adopted by the Franklin Company, to my knowledge.

I don't know from actual experience whether or not some of the other companies tried to use trunk type aluminum pistons.

I did not see a trunk type aluminum piston as far back as at the time I saw the Long piston. I never saw any in the Marmon cars in the early days.

This Exhibit B piston succeeded the cast iron piston in the Franklin car, but I don't think the first few of them had those four slots in. I think they were in the solid skirt. They used this "trunk type" piston, with the solid skirt, only a very short time, then they went to this Exhibit B. They made this change so that they could fit the skirt a little closer, and it would not stick. They didn't have any trouble with the trunk type aluminum piston sticking in the cylinder, but they had trouble with them slapping.

When the first Exhibit B pistons were used, they did not have this ring on the inside, that I spoke of. They were used without that ring for a few months. The ones with the slot still slapped and we put the ring in to squeeze them out, so they would have more flexibility. They were used just a few months with the rings in, then they changed to the Long type. That change was made because the Long type piston was so constructed that they could be fitted very close and they wouldn't seize when they were hot.

We had no trouble with Exhibit B because of the ring seizing, but we had trouble with them slapping.

I believe other automobile manufacturers besides Franklin Company used pistons like Exhibits E, F, and G after 1920, but I don't recall who they were. I don't know of my own knowledge.

The Invar strut piston was substituted for the Long piston in about 1928. That Invar strut piston was a piston that had a slot extending from the bottom ring land to the bottom edge of the skirt of the piston, on one side of it, and there are two steel struts mounted in practically the same position as the Long piston, extend-

ing from side to side. That is all I remember about it, with the exception that there was a skirt slotted underneath the bottom ring groove, on both sides, underneath the head. There was only one slot running the full length of the skirt. I have seen a large number of those pistons between 1928 and the present time.

I saw more pistons like Exhibits F and G, between 1920 and 1928, then I have seen of the Invar strut.

I have attended sales conventions, at Syracuse, where the Franklin dealers assembled. I don't recall of attending any sales conventions at Syracuse while I was in South Bend; I did some, at Chicago, that they would have at show time there, and I attended some at Syracuse during the time I have been in St. Louis. I don't think I ever attended any other kind of conventions or meetings at Syracuse, while I was at South Bend. I attended probably five or six while I was at St. Louis. I think the date of the earliest one was about 1923.

I frequently went to Syracuse on visits, sometimes twice a month, and sometimes two or three months apart, while I was at South Bend and also while I was at St. Louis. When we were in South Bend we used to drive back most of our cars, and I went to the plant at Syracuse a lot for that purpose; and, it was my home and my folks' home, so I visited there while I was there. I don't believe I was ever in Syracuse that I didn't go up to the Franklin plant. These visits to the Franklin plant have extended from 1916 to date. I was there just a few weeks ago.

I was at the Franklin plant in Syracuse last September and Mr. Caster was just packing his tools up to leave; he had been laid off; in fact, they closed the whole drafting room. I don't know whether he is back again, or not. There was considerable activity there in the drafting room two weeks ago, when I was there. I didn't go in; I just stuck my nose in the door. I knew Mr. Caster there over a period of years. I also knew Mr. Marks; he is still there. I have known him ever since he went there to work, whenever that was. I don't know just how long ago that was; a good many years ago.

The first actual work I did when I went to the Franklin factory was drilling holes in little quarter-inch cap screws—I beg your pardon; that was not the first work I did; I helped to assemble motors very shortly after I went there. I would say that was around 1909, or the early part of 1909. I helped to assemble motors, I think,

not over six months; then I was head assembler, with a helper of my own. I worked at that a couple of years; that carried me up to about 1911; I don't remember the exact month. I am pretty certain that it was around 1911, because I left there for six months and went to work for the Fiat Company, in 1911, and went back. I left the Franklin Company in March or April to go to the Fiat Company, and it was somewhere between four or six months later that I came back. I was several months with the Fiat Company in Poughkeepsie, N. Y.

I assembled motors after I came back to the Franklin plant, and I continued in that work for the remainder of the year. I next was inspector, for a few months, of the engine assembly. Then I took charge of the motor noise test department; that was about the first part of 1912; and I continued in that department until somewhere along in August of 1912. Then I went to work for the engineering department, in the experimental laboratory. I stayed there until the early part of 1913. I don't remember what month of 1913; I could tell from records I have. My next job was to go on the road for the Service Department in the early part of 1913. I was mixed up with that job—I did a little work for the engineering department and the sales department for practically the next three years, returning to the factory occasionally, for possibly a month or two.

Mr. Stellman was present when I had that conversation with Mr. Long about this piston. No one else was present. Mr. Stellman was then employed at the Franklin plant. I usually saw him on these trips that I made to the Franklin plant. He had been my superior there. I always considered him a good friend, and always went to see him every time I was there.

I made this drawing, Exhibit A, this morning. I made it in the next room to Mr. Bruninga's office—in his library at his request.

I started about ten o'clock this morning to make Exhibit A, and completed it twenty or thirty minutes later. I used no drawing instruments and my only equipment was a pen I found laying in the desk, about two inches long, and I used my own pencil and a ruler I found laying there. I brought no equipment with me for making it. At the time I made it I assumed that it might be used in connection with my testimony. I had seen similar pistons like Exhibits E, F and G, elsewhere, prior to the time when Mr. Bruninga asked me to make this draw-

ing. The first time I saw these pistons, E, F and G was when he laid them on the desk there, this afternoon.

The drawing, Exhibit A, is very similar to the drawing of this piston, Exhibit F—practically the same. Except that it is a sand cast instead of a die cast, this Exhibit F was the standard piston of the Franklin Company for a good many years, and I saw it from year to year, between 1920 and 1928.

The conversation with Mr. Long, when Mr. Stellman was present, took place at the Franklin factory, right outside of the door leading into the experimental room, inside the yard. I had a conversation with Mr. Bruninga about my testimony here, several months ago. I didn't know that I would be called as a witness at that time. Mr. Bruninga told me a couple of days ago that I would be called as a witness, and I had a discussion with him at that time, but not about what I was going to testify to. He asked me a lot of questions and I believe he wrote down the answers. I believe it was this morning that he mentioned that I might be interviewed by Mr. McCoy or by you, (Richey) or by somebody representing the other side. He told me to tell you that I would be glad to answer any question for you, on the witness-stand, if one of you interviewed me. He did not tell me not to answer any questions that you might ask me prior to the time I got on the witness-stand—he said just what I said before—that if you asked any questions, to tell you I would give the answers when I got on the witness-stand. Neither Mr. Long nor Mr. Fletcher ever asked me to testify in any other causes regarding this Long piston. I don't know for how long a period Mr. Long was a Franklin dealer—he was a Franklin dealer a good many years ago. I believe I first knew that Long was a Franklin dealer when I went on the road for the Company, because I had the list of all the dealers, and still have it. I do not know how long he continued to be a Franklin dealer. I did not know him prior to 1916, and never saw him in Quincy—in fact, I never did travel that particular town. Nobody ever asked me to testify in any other cause regarding these pistons, except in this one. I was never told that any other causes existed regarding these pistons, excepting this one.

The bulletins I have been asked about were kept among my personal records. There were a whole stack of them, several inches high. I brought only a few of that whole stack here—four of them. I produced only

four because I picked out the ones that I could find, that referred to this particular piston here. I picked out those four because Mr. Bruninga asked me—I mentioned the fact that it was mentioned in service bulletins, and he asked me if I had any, and I said I would try and find them, which I did.

On November 11, 1920, it was well known that aluminum alloy had distinct advantages as a material for pistons, because it was light in weight and its great ability to throw off heat over cast iron. It was also known at that time that one of the disadvantages to the use of aluminum alloy for pistons was the clearance which was necessary between the pistons and the walls of the cylinders. And at that time it was known that that was due to the fact that the aluminum expands more rapidly than the cast iron. The excessive clearance that was necessary, particularly with the cold motor, had a tendency to make it noisy, to say nothing of affording an opportunity for the escape of gasoline past the rings and into the base, and also allowing an excess amount of oil to work up past the rings; that is correct. That was all known in November, 1920, and prior thereto. This Long type of piston, like those I have been talking about, according to their bulletin there had not proven satisfactory in production, by the Franklin Automobile Company, on April 8th, 1920. To my own knowledge, I don't know anything about it.

There was a time that the Franklin Automobile Company used an oval type piston. That was around 1922, I believe. They used only a very few of them, and to the best of my recollection, it was ground so that the skirt was much smaller in diameter on the wrist-pin hole sides. There was a very small bearing on the opposite side of the wrist pin hole, and it had a sawed slot underneath the bottom ring land, on both sides. I saw some of those pistons, but I don't believe I saw over two or three dozen of them. I believe around April, 1922, they went through production, in small quantities. The results they obtained were so bad that they went back to Long. I dispute the statement in Bulletin H, April 18, 1922, Exhibit H, reading: "A piston which is ground oval in shape and for this reason known as the oval type piston has been going through production in small quantities since last summer. The results being obtained with this piston are so successful that it may be adopted for standard

productions." They may have been of the opinion at the time that it was true, but it didn't work out that way. According to my experience, it is not a true statement. I don't see why the experience of the people who prepared this bulletin, Exhibit H, would be any different than ours. It may have been a true opinion on their part, but I don't think it was a correct one. I know from the experience that we had with them in cars, that they were not satisfactory. I don't know whether the statement is true or not. I don't know why they were experimenting with this oval type piston down at the Franklin factory.

Piston slap is a noise caused by the striking of the piston wall against the cylinder wall, and a ping is the detonation of the gasoline in the combustion chamber.

The instructions contained in this Exhibit I, Franklin Service Bulletin, dated February 20, 1923, which shows cuts, relate to the piston illustrated on the initial page and at the top of the second page.

I will bring with me tomorrow the balance of these bulletins, from which I selected these four that have been offered in evidence here.

When one of the first Long pistons that we used scored, we substituted another one for it, in St. Louis. It had been in the cylinder a very short time—a few weeks—before we made the substitution. We found, upon removing the first piston, that there was a tearing of the metal and on the two faces that bore on the cylinder wall, on the thrust faces, which was due to its rubbing against the iron cylinder. That piston came in the first Franklin car that was received by us equipped with Long pistons. That car ran seven or eight hundred miles before it scored. That was in the early part of December, 1920, I believe. I don't remember where the substitute piston came from, because we probably had pistons from Franklin and from Weems in stock at that time.

We first dealt with R. C. Long for the Long pistons, and then I think it was M. K. Weems. I don't think we had any correspondence with them, other than sending them an order and receiving a bill for it. In fact, I think they were sent C.O.D. at that time. I think the only thing I did was to write them a letter and tell them to send me so-and-so. I don't remember whether they sent a bill, or sent it C.O.D.

We bought several dozen pistons from Weems. That would probably be a dozen shipments or more. I don't

remember whether they were sent C.O.D., or were the regular transaction. We would probably have records of the transaction at that time. Those records are destroyed. The company has been out of business a good many years. I kept these bulletins because they were of value to me and the other records were not. I kept the bulletins but I didn't keep the other records. I cannot say whether any one of these shipments were C.O.D. or on a regular transaction. I don't remember exactly how many shipments there were. I don't remember when the last shipment was received; that was a good many years ago. I ordered them so many different places; sometimes from the factory, and sometimes from Weems, and I don't remember which was which. I don't remember when we ordered or received the last shipment from Weems; that is not too far back to remember, but I just don't remember; I had no occasion to try to remember it.

The Franklin Company did not, to my knowledge, try out any other pistons than the oval type pistons and the Invar strut piston, between the time the so-called Long piston was adopted by them, and the time it was abandoned.

I was in South Bend, Indiana when I made this sketch, Exhibit K; I don't remember whether I made it at the office or at home. I had a model before me when I made that drawing, because the one I made previous to that I had the patterns made from. I made that one for the patent attorney to apply for the patent with. I turned it over to my patent attorney the early part of April, 1920, or it might have been a little sooner than that. I don't recall the exact date. To be more exact, I imagine it was probably the early part of March when I took it up to him. It must have been some time between the time I made it and the time he filed those papers. I have no recollection, independent of these dates on the sketch and the application, when I did deliver it to him. I not only fix it by those dates, but I can also fix it by the fact that it was shortly prior to the time I came to St. Louis.

I said these castings were made by the Aluminum Company of America, but it might have been the Aluminum Castings Company; it was the company that made Lynite, the people who have the trade name Lynite. I don't remember the name. It was not the Aluminum Manufacturers, Inc., and it was not the U. S. Aluminum Company.

We had correspondence with the company that made our castings, about those castings. I don't think they made blueprints or drawings of the castings—I sent them the molds which we had made by The Peerless Pattern Company, South Bend, Indiana; I should not have said the molds; I meant the patterns. I presume the company in Cleveland, that made the pistons, made the molds.

I don't recall exactly how much we paid them for the castings, but I believe it was around $2.95 apiece, and that included the molds; they were charging for the finished product that they turned over to me. I think I bought about two dozen castings from them, two or two and one-half dozen. I imagine I paid them from seventy-two dollars to one hundred dollars. My recollection of the price is not accurate. I don't remember how much I paid them; it seems to me that it was sixty or seventy dollars, although I don't recall.

The purpose of my piston was not to accomplish the same thing as the Long piston; I thought I had an improvement on his, but I found out I didn't. I was undertaking to improve upon the Long piston. I thought that by suspending those independent skirts from the head, that the expansion would take place downward, but I found out I was mistaken about it. I wanted the expansion to take place downward so as to obtain less expansion than there was in Long, so that I could fit them much closer. I read over this application, Exhibit J, between the time my attorney prepared it and the time I filed it.

It is true that, as stated in this abandoned application of mine, Exhibit J, one of my objects was as follows: "The invention relates to pistons and has for its object to provide a piston especially adapted for use in air-cooled internal combustion engines, and to provide a piston so constructed, that the use of aluminum and other light metals may be accomplished, thereby giving lightness of reciprocating parts, which metals have a greater relative degree of expansibility than the cylinder casings under the same temperature." That is what I understood the Long piston did. When this application was filed, I was stating to the Patent Office that the purpose of my invention was to do what I understood the Long piston already did, but a little bit better. This statement does not say "a little bit better," but it may further down; I don't know.

Q. This says, "The invention relates to pistons and has for its object to provide" this thing that you knew at that time the Long piston was doing? A. Yes, sir.

Q. Still you were representing to the Patent Office that that was the object of your invention? A. Yes.

Q. The same thing that you say you already knew the Long piston did? A. Yes, sir.

(Narrative continued) I don't know who, on behalf of the Cleveland Company, corresponded with me with respect to these castings, which I said I had made. I don't remember the names of anybody. They wrote me one letter telling me that they would like to hear the results that I obtained, and also mentioned the fact that if it proved out satisfactory, that they might be interested in it; to send them some information about it, or something to that effect. I did not write to them afterwards; I never answered that letter, and never got any more pistons.

(Thereupon, the further taking of the deposition was adjourned until April 28, 1932, at ten o'clock A.M.)

(Met pursuant to adjournment as above, on April 28, 1932, at ten o'clock A.M.)

Cross Examination by Mr. Richey (Continued)

XQ. 249. Referring to "Defendants' Exhibit J," your forfeited and abandoned application for your patent, page 3, beginning at line 15, reads as follows: "Pistons of this character in the past, on account of their greater expansibility than the cylinders in which they are used have been found, when subjected to extreme temperature, to bind or seize the bore of the cylinders, and where sufficient clearance has been allowed in the skirt of the piston, under low temperatures, the piston slaps." That was a true statement at the time it was made, was it not? A. I didn't write those myself, but I guess I signed it on the end, didn't I?

XQ. 250. You said yesterday that you read it over and signed it? A. Yes, sir.

XQ. 251. The statement I read in the first question this morning, was true? A. It was the true opinion at that time.

XQ. 252. Was it not true in fact? A. I don't know whether it was or not.

XQ. 253. It is not a statement of opinion; it is a statement of fact. In the question I read, that was a true statement of fact at that time, was it not? A. It was my opinion that it was, yes.

XQ. 254. It was your experience, too, that it was true, wasn't it? A. Yes, to some extent.

XQ. 255. Well, how do you want to modify it, if it is incorrect? A. The Long piston, when you allowed three to three and one-half thousandths clearance didn't do the things it said in there; however, with smaller clearance, it did.

(Narrative continued) This statement I made applied to the Long piston, under certain conditions. When that statement was made, I knew about the Long piston.

XQ. 258. And still you did not modify the statement to except the Long piston? A. It doesn't say, in that, all pistons; it says pistons of this character, doesn't it?

XQ. 259. Yes, but by "pistons of this character" you meant of the character shown in the application, did you not? A. Aluminum pistons as a whole, I presume.

(Narrative continued) The Long piston was an aluminum piston. When I made that statement there, I claimed to have had the Long piston and the others that were used in mind, and to have known about it. I did not except the Long piston, in the statement, because I thought that one would run with much closer clearance than Long. I intended to include the Long piston in that statement at the time I made it.

The clearance allowed for the Long piston was from three to three and one-half thousandths.

The advantage of having a narrow clearance between the cylinder and the piston, is that there is apt to be less oil pumping; it allows the ring face to stay flat against the cylinder wall. It will give greater ring life and longer life between replacements. The disadvantage of the oil pumping is that it uses oil and fouls spark plugs and causes frequent valve grinding, and carbon accumulation. It pumps oil into the combustion chamber. The disadvantage of the effect on the piston rings of the large clearance, is that it allows them to rock and become sort of circular on the face, instead of flat. It would probably wear the edges of the piston ring grooves faster and, in addition to that, cause a slap.

Referring to the Invar strut piston, which I spoke of yesterday, the clearance on that, as I recall, is three

and one-quarter to four thousandths. The clearance there was about the same as the Long piston. The Invar strut piston was used in other engines besides the Franklin engines; in a great many other automobiles. I do not know that it was fitted to less clearance with other automobiles, than three and one-half to four thousandths.

XQ. 277. There was also an aluminum piston known as the split skirt piston, that had no Invar strut in it, that was used quite generally prior to the Invar strut, was there not? A. Well, the only one that I saw, the split didn't extend clear to the top of the skirt. There was a little hole drilled in, and it extended almost to the top. I believe the piston was made by the Aluminum Company of America.

(Narrative continued) I am familiar with the split skirt piston that had a recess at the boss and webs across —that is the one I am referring to. Those pistons were quite generally used, beginning about 1924 or 1925, and I believe they are still in use, though I am not sure.

I was married on April 8th, 1916, and left Syracuse on a wedding trip right after the wedding. I spent the first night in Buffalo; the second night in Williamsport, Pennsylvania; the third and fourth nights in Chicago, and the next day in South Bend—about five days in all. I was in Syracuse two weeks, I believe, or a little over two weeks before I was married. That is, I went down and stayed two weeks before I was married, and then spent five days on my wedding trip.

I said I made this drawing, Exhibit A, yesterday, here in this office. I drew those red lines in there, not the whole thing, just the red ones. Yesterday, when you asked me if I made this drawing, I didn't intend to say that I made the whole drawing—I didn't make the whole drawing. It is not a drawing; it is a photostatic copy. Mr. Bruninga gave that photostat to me; everything in black, except these reference numerals, was on here when I started on it, and when he handed it to me. I put the letters and shaded portion on there, and the little dotted section of the web, shown on Fig. 5; that is all I did. Yesterday, when you asked me about it, I did not make that distinction. It would be quite ovious to you that I didn't make the photostat.

I don't know how much there was to that application, Exhibit J.

After I got here in St. Louis I decided not to proceed with this application; in fact, I believe it was just

about the time I left South Bend, in May, 1920. At that time I learned that the Long piston was a good piston.

I never instructed my attorney not to proceed with the application; I just ignored his letters.

Mr. Richey: I should like it to appear that there was an amendment filed in this application, by the attorney, November 26, 1920, which was responsive to the Office action of September 20, 1920, and that that is the one that was referred to in Exhibit L; and further, that there was an interference letter of February 15, 1921, sent to the attorney, and under the practice, one would also have been sent to Mr. Venner.

(Narrative continued) I would say that I received those first Long pistons from M. K. Weems, Quincy, Illinois, during the middle of 1920; however, I am not certain about it. It was not many months after the Series 9-A came out.

The pistons illustrated in my application, Exhibit J, were not any better than Long's. It is correct that the tests were made before the date of this sketch, Exhibit K, which is February 16, 1920.

XQ. 311. Then, why did you file your application on April 12, 1920, if the tests had already shown you that the pistons were not as good as Long's? A. The tests were not completed at that time; they were in cars, running, but I didn't discover it until there was some considerable mileage on it.

(Narrative continued) It is correct that I did not complete these tests until after the application was filed. I did have them in cars before February 16, 1920. The first one I put in just one, just one piston. It was very satisfactory. Then I put in, I believe, a couple of sets more, or a full set, I don't recall which, and those were in the car at the time the application was filed. I did say yesterday that I made some of the tests before February 16, 1920; they were partially made. One of the tests was completed before that date, but the other was not. The first test was of but one piston.

I believe this Series 9-A car came out in November of 1916.

There was an advertising campaign about the first part of 1920, trying to stimulate a demand for cast iron pistons. I believe the use of such pistons in Franklin

cars was discouraged by the Franklin Company. The purpose of these special design pistons was to reduce the weight of an iron piston.

RE-DIRECT EXAMINATION by Mr. Bruninga.

RD. 1. Referring to "Defendants' Exhibit A": What do Figs. 1 and 2 illustrate?

Mr. Richey: We object to that; he has already testified about that.

A. It illustrates the old style plain trunk piston.

By Mr. Bruninga:

RD. 2. Yesterday, Mr. Richey intimated that these figures might have been made from a Franklin piston; do you know whether they were? A. This drawing, Exhibit A?

RD. 3. Yes; the drawing that was handed to you. A. No. That piston, a piston like that, was never used in a Franklin.

Mr. Richey: That is, like shown in Exhibit A?
Mr. Bruninga: That is, like shown in Exhibit A.
The Witness: In all the details, yes.

RD. 4. What do you mean, Figs. 1 and 2, or the rest? A. One and two.

(Narrative continued) My attention has been called to page 149 of The Gasoline Automobile, its Design and Construction, Volume 1, The Gasoline Motor, by P. M. Heldt, Editor of the Horseless Age Co., 250 West 54th Street, New York, 1915. Comparing that piston, illustrated on page 149, with Figs. 1 and 2, so far as general structure is concerned, I would say it was identical, with the exception that the one on page 149 has four ring grooves, and Figs. 1 and 2, on Exhibit A, have three ring grooves. Figures 3, 4, 5 and 6, as I have drawn them, are distinguished from that particular piston on page 149, of the book, in that the piston on page 149 is a solid skirt piston, the skirt being an integral part of the head. Figs. 3, 4, 5 and 6 show the skirt as being in six sections, four of which are supported by webs from the wrist-pin boss, and being otherwise entirely independent of the head. In other words, Exhibit A was furnished me as a photostat without any red lines or lettering on it, and I added those red lines and also the shading at k, to that piston; also the dotted section, e, on Fig. 5.

RD. 9. And is that the way the Long piston 1916 differentiated from an ordinary trunk piston?

Mr. Richey: I object to the question as not being justified by the record.

A. Yes, sir.

Mr. Bruninga: It is stipulated that the book, "Gasoline Automobile, Volume 1," examined by the witness, was published in 1915, and that a photostat of the drawing on that page may be introduced in evidence with the same force and effect as if the original book were produced.

I offer in evidence the photostat, as "Defendants' Exhibit M."

Mr. Richey: I object to it as immaterial.

Mr. Bruninga:

RD. 10. Mr. Richey asked you with reference to cast iron pistons used by Franklin, during the first part of 1920: Do you remember how those pistons were constructed? A. They didn't use any cast iron, in 1920.

RD. 11. In what year did they use cast iron? A. 1916, was the last year.

Mr. Bruninga: Mr. Richey referred to a digest of the proceedings in the Venner Application, Serial No. 373,340, which I handed to him, this digest being of official actions and proceedings following the filing of the application. I offer in evidence that digest, as "Defendants' Exhibit J-1," together with the original of the official letter of February 15, 1921, and the notice of allowance, dated January 16, 1922.

Mr. Richey: In view of the offer, I withdraw the statement I made about the character of these papers, and suggest that this exhibit be attached to Exhibit J, since they both constitute a part of the same proceedings.

(Narrative continued) Greater expansion takes place in the pistons of an air-cooled motor, as distinguished from those which are water-cooled, up to recent series Franklin, which are much better cooled. By "recent series" I mean from 1930 on.

RD. 14. Would you say that a piston which operated satisfactorily in a Franklin air-cooled engine, had a good test?

Mr. Richey: I object to that as incompetent, being merely the opinion of the witness.

A. Yes, sir.

(Narrative continued) From experience with both air-cooled and water-cooled engines, I would say that the test of a piston in an air-cooled engine is much more rigid.

There was a piston used prior to this Exhibit B here, without the slots in the skirt. It was fitted thirteen thousandths under the bottom ring land; eight thousandths at the bottom of the skirt. Piston B was fitted, I believe, eleven thousandths under the bottom ring land, and five thousandths at the bottom of the skirt. The piston used prior to this Exhibit B piston was a straight trunk aluminum piston, without the split skirt.

The Long pistons were fitted about three thousandths in 1920, the full length of the skirt.

As to the manner in which you and I got in contact, Mr. Sutherland of your (indicating Mr. Bruninga) office, called on me last year sometime, and said that he had been down to the Franklin dealer, and that the man in the stock room told him that I could probably give him some information about it, as he knew that I was familiar with pistons as used in Franklin trades. Sometime later you called me and asked me to come down to your office, which I did. You asked me if I knew anything about the Long piston that the Franklin used, and I said yes, that I had met Mr. Long the first time he ever came to the Franklin factory with this split skirt piston—

Mr. Richey: I object to this conversation as incompetent.

Mr. Bruninga:

RD. 24. Did I ask you for facts, or did I tell you what I wanted you to testify to? A. You asked for facts, and intimated that I didn't know what I was talking about.

RD. 25. Did I give you just a cursory examination or a rigid examination?

Mr. Richey: I object to this whole line of testimony as incompetent and immaterial.

A. A rather rigid examination.

RD. 26. Were you coached at all by me, what to testify to? A. No, sir.

(Narrative continued) The cause of the scoring of pistons is not always the piston construction. Lack of oil and extreme heat can cause it.

In the 1920 Franklin automobiles, the oil was furnished by a pressure system—the pressure feed in the main bearing, through the crank-shaft, and connecting rods, and then thrown up on the cylinder wall. It fed to each individual main bearing, then to each connecting rod, and the throw-off of the connecting rod bearings lubricated the piston and cylinder. in other words, here were separate pipes to each bearing. These pipes lead from a distributor type oil pump, in the bottom of the oil tank case, and was distributed to the various conduits. There was liability of clogging of these conduits, which happened occasionally.

The castings which I testified were made of my pistons, in accordance with the application Serial No. 373,340, were sand cast.

I don't know whether I discussed the Long piston or not with Mr. Oltsch before I filed my application.

RD. 38. At the time that you filed this application, had you found the Long piston not practical?

Mr. Richey: I object to that question as incompetent.

A. No.

RD. 39. Have you ever seen a perfect aluminum piston? A. No, sir.

RD. 40. Referring to the statement on page 2, of "Defendants' Exhibit J," reading as follows: "Pistons of aluminum and alloys on account of their relative greater degrees of expansibility than the cylinder casings, tend to seize the cylinders under high temperature, unless considerable clearance is provided and too much clearance is impracticable." Does that refer only to the Long piston?

Mr. Richey: The question is objected to as leading.

A. No, sir; that referred to the pistons that didn't have a slotted skirt.

RD. 41. Did you so understand it, as referring to that? A. Yes, sir.

Mr. Bruninga: That is all.

RE-CROSS EXAMINATION by Mr. Richey.

The Franklin piston known as the straight skirt piston was the Long type. The 9-B series was the succeeding model, of the 9-A, and was started about 1918. It was used until 1922.

Regarding the journal called "Manual for Trouble Shooters Franklin Automobile Company": The article on pages 8 and 9, on piston slap, dated November 1, 1923, Series 9 and 10 cars is correct, with the exception that they didn't fit that straight skirt piston with as much clearance as they state there. It was nearer three and a half to four thousandths, than it was five. It is stated here to be five. May I ask when the book was published? November 1, 1923? Then I withdraw the statement I made regarding the clearance—that was correct at that particular time.

They commenced fitting these Long pistons with five thousandths clearance when they increased the compression ratio to such an extent that there was a great deal more heat generated, in 1922. They continued to fit them with five thousandths clearance for about a year, then they dropped back to a lower clearance, because they put in a different cooling system.

This same article gives the clearance at the bottom of the skirt of an oval piston, as three thousandths. I believe that was correct for the clearance for those pistons, at that time.

Mr. Bruninga: The book produced by Mr. Richey is marked for identification as "Defendants' Exhibit N."

(Narrative continued) The clearances given here, for the three types of pistons—tapered, straight and oval—were correct at that time. The article deals with piston slap and contains instructions how to detect it and how to cure it. Its statement, "Slaps are due to the clearance allowed between the piston and the cylinder walls," is correct. The statement "Aluminum pistons expand more than cast iron or steel ones, and since this extra expansion requires more clearance, they are more apt to slap," is not, generally speaking, correct. The piston marked "straight," on page 9 of this book referred to, was a Long type piston, like Exhibits E, F and G.

Mr. Richey: That is all.

Mr. Bruninga: Deposition closed.

Mr. Bruninga: I want to offer in evidence "Defendants' Exhibit N."

Mr. Richey: That is objected to, as it is all immaterial, except the part on pages 8 and 9, that are entitled "Piston Slap." The balance of the book refers to other features, steering, position, and things of that kind, not involved in this case.

CHARLES L. CHADWICK, a witness of lawful age, being duly produced, sworn and examined, testified in behalf of defendants, as follows:

DIRECT EXAMINATION by Mr. Bruninga.

My name is Charles L. Chadwick, and I reside in Quincy, Illinois. I am in the machinery business, operating now under the name of Tri-Point Corporation. Formerly we operated under the name The Weems Machine Company, and later, Weems-Chadwick Industries.

I am a tool maker by trade and have made lots of patterns. I also have had experience in automobile repairing. I started to work at the machinist trade for my father, at the age of fourteen, and was with my father for a number of years; and from there, to H. M. Sheer Company of Quincy, where I worked for some four or five years. I was foreman of their shop, and devoted most of my time to tool making. The Sheer Company's line of business was incubator supplies.

Then I left there and worked for the Wabash Railroad Company for several months; then went back with the H. M. Sheer Company; left the H. M. Sheer Company and came to St. Louis and worked for the A. Wister Company; then back to Quincy, in business for myself, for a little while—the machine business; and then went with the H. M. Sheer Company again; and from there to Mr. E. C. Long, in December, 1918.

When I was in the machine business myself, we did a good deal of automobile repair work, in connection with our machine shop. We serviced cars, and placed in new pistons. At that time, most of the pistons that we replaced in cars, we had to make ourselves. That was back between the years of 1910 and 1912. I, myself, made a number of pistons, but most of those were cast iron pistons. I had had very little experience with aluminum pistons before I came to Mr. Long, in December, 1918. Somewhere around the time of 1914, there was an

aluminum installed—I think, in a Haynes car. That was the first aluminum piston that I had seen in an automobile. I made an aluminum piston myself in experimenting, but owing to the poor casting, I never even put it into a car. That was a piston near the standard solid type piston, only it had a little bead on the inside of the skirt, I cut a slot through that bead, or ridge, to take up the expansion. That piston never was installed in a car; I never kept any record or anything of it. That was around '14; somewhere around there. I couldn't tell you any date, but it was before I went back with the H. M. Sheer Company. It was while I was in business myself. We had our shop on Main—or, on Seventh, between Main and Jersey, in Quincy, Illinois.

I have no way of fixing the date that I came to Mr. Long, further than memory. There was a little misunderstanding in regards to salaries, when I went with Mr. Sheer, and so I notified him on the first of December that my resignation would take place the first of January. Mr. Sheer was a man that was easy to upset, and he told me I could quit whenever I got ready. I was working for him on Armistice Day.

Just before the Armistice, Mr. Sheer and I came to an agreement as to an increase in salary, which he was to pay me outside of my regular weekly check, and after the Armistice was signed, I did not receive this extra amount. That was the reason that I left his employ when I did. After Armistice Day, he said that he thought he could be able to get someone to take my place, as the War was over and the boys would all be coming home. I stayed on about two weeks, as near as I remember, in order to finish up some things that I had started, before I left. I went to Mr. Long in the latter part of December; I couldn't mention the date, but I am positive it was before Christmas.

Mr. Long's place was located on Eleventh and Main Streets, Quincy, Illinois. I had had some previous negotiation with him about a job. He came to me sometime in August, and wanted me to go to work for him, but I didn't leave Mr. Sheer at the time. Before I left Mr. Sheer I talked to Mr. Long, and he told me any time I wanted to leave there, why, just to come out and go to work. I quit H. M. Sheer Company on Saturday night and Monday morning I went to work for Mr. Long.

I started as foreman of Mr. Long's shop, and was employed from December, 1918, until November the first,

1919, when Mr. Long sold his business to Mr. M. K. Weems. Mr. Weems died in July, 1930. I stayed in that shop, after Long sold out, and am there yet, in the same shop. After Mr. Weems died, I purchased the business from the Weems estate, personally. It is operated now as a company, as the Tri-Point Corporation. It is a corporation, now. The Company owns the business now, but I bought it personally from Mr. M. K. Weems. Then, in March, 1931, I consolidated with the Tri-Point Corporation. It is operated under the Tri-Point Corporation, now.

There were pistons being manufactured by Mr. Long at the time Weems took over the business—a piston with a slotted skirt; aluminum type, aluminum piston. It originated from an ordinary trunk piston, by putting a rib across from the wrist-pin boss to the side wall of the piston. By putting the ribs across from the wrist-pin boss to the side wall of the piston, it could be slotted with six slots. That was the kind of piston that was being manufactured by Long when Weems took it over, on November 1, 1919.

Mr. Long was making some of those pistons when I went to work for him, in December, 1918. And, as I previously testified, that they were distinguished or differentiated from an ordinary trunk piston by the fact that they had webs and slots in them.

Q. 54. I gave you yesterday a photostat of an ordinary trunk piston and asked you to change it or add to it, in order to produce the piston that you saw when you first came to Mr. Long; can you produce that drawing? Have you made such a drawing? A. Yes, sir (producing drawing). I have this drawing here, which is nothing but an ordinary trunk piston (referring to Figs. 1 and 2).

(Narrative continued) No. 1 shows the one with the wrist-pin. No. 2 shows the piston turned in an opposite way, looking through the wrist-pin hole. No. 3 shows the piston by having slots, two slots, on the side, looking through the wrist-pin hole. No. 4 shows the piston on the opposite side. The line shows three slots. No. 5 shows the interior of the piston, and the red line indicates the rib that is added to the wrist-pin boss and connected with the side wall of the piston. That is to hold those two walls in position after the piston is slotted. No. 6 shows the rib across the other way.

Mr. Bruninga: The drawing produced by the witness is marked for identification, "Defendants' Exhibit O."

(Narrative continued) I put the red lines on the drawing, Exhibit O. Figs. 1 and 2 are views of a standard trunk piston. To my knowledge, such trunk pistons have been in existence ever since I knew of a gasoline engine—back in 1909. It had the cross-web, a, in it at that time. Of course, all iron pistons do not have that. Some pistons are heavy enough to carry that strain, without putting that in. In order to lighten the piston you put a rib on the top of the piston. And those trunk pistons had the wrist-pin bosses, b, and had the ring groove, c,—some had two and some had three grooves.

On Figs. 5 and 6, the parts, d, is an added rib, extending from the inside of the piston wall to the wrist-pin boss. Those were in the Long piston I saw when I came to Mr. Long. They were cast pistons. The side walls and this rib was practically one piece after the casting was made. The part e, in Figs. 3, 4 and 5, indicates the small groove that was cut around under the lower ring land to separate this side wall of the piston from the head. It went clear through the skirt, all the way around. Not opposite the wrist-pin bosses—there is a little reinforcement there to take care of that over the wrist-pin boss; otherwise, the piston will fall through—. The parts, f, in Figs. 4 and 5 was a slot extending from the lower end of the piston to this groove that was cut all the way around the piston. That went all the way through the skirt. There were six of those slots in the piston.

The parts, g, are slots that were cut between the rib that was cast on the inside of the piston, and the wrist-pin boss, and went all the way through the skirt. There were four of those slots like the g, and two like the f, making six slots. In Fig. 6, which is a cross-section showing the same general view as Fig. 3, I have a slot marked "Y": that is in Fig. 6, but it is not in Fig. 3; that should not be in there. That was a mistake on my part.

Figs. 3, 4, 5 and 6, illustrate the piston that I saw at Mr. Long's when I came there in December, 1918. I would say that piston was being made at that time, by Mr. Long, out of aluminum alloy. They were made from sand castings. Some of the castings came from Walker M. Levett Company, New York City, when I came with

Long, in December, 1918. Others were made in St. Louis, Gilbert Foundry Company. A wooden pattern, wooden core box, was being used for making that kind of piston. The pattern itself did not differentiate from an ordinary trunk piston; the difference was all in the core box. The core box differentiated from those used in ordinary trunk pistons, just by putting in the small piece, that made this rib from the side wall of the piston to the wrist-pin boss. I could produce a core box of the kind that was being used at that time.

(Witness produces core box which is marked for identification as "Defendants' Exhibit P.")

This core box was among the patterns that Mr. Weems bought from Mr. Long. I had seen it before Mr. Weems bought it from Mr. Long. The entire core box is as it was originally—there has nothing been added. The two pieces you indicate were lost out of it, and we just made them in St. Louis yesterday, under my directions, and put them back.

Taking that core box, Exhibit P, as it stands, without those recesses on the side, which receive the lugs on the two pieces the core box is just the same as an ordinary core box for an ordinary trunk piston.

Mr. Bruninga: I will mark the two pieces as P-1 and P-2.

(Narrative continued) P-1 and P-2 are the two ribs that extend from the side wall of the piston to the wrist-pin boss. And when in place, they make holes for the ribs.

The procedure followed by the core maker in making a core box like Exhibit P, using the two pieces in place, is as follows: The core maker prepares his sand; he removes these two ribs, P-1 and P-2, and fills this box with sand up to the position where these ribs set in. He puts those into their position, and when he is finished, fills this box with sand. Then it is swept off at the top and makes a perfect tray, in which he lays an iron plate. He turns the complete core box over with the plate, leaving the sand on the plate. Then he gently pulls this rib, P-1 and P-2, outside the box, which leaves an opening for the metal to go in where it enters the hole. Yes, after the core has been made, with the pieces, P-1 and P-2, in place, the core box is turned upside down with the metal plate, and these pieces come out of the core box with the core.

That leaves an opening in the core for the metal to run in, and become a part of the wrist-pin boss.

The core maker uses different things to make the sand stick—such as alloy, paste, molasses; a mixture. This particular core box will make only half a core, and in order to make an entire core, the core maker takes two of these halves and places them together in a perfect circle. After it is made, the core is put in an oven and baked, then the two baked parts are glued together, and that makes the complete core.

Q. 113. I understand you to say that you saw such a core box as Exhibit P, at Mr. Long's place of business when you came there?

Mr. Richey: That is objected to as leading.

A. Yes, sir.

(Narrative continued) I have had no actual experience as a molder or core maker, further than my pattern making and machinery and tool designing would go.

The thickened part in the core, between the wrist-pin boss and the top of the head, and the two thickened parts on each side of the web, are reinforcement there to strengthen that where the skirt is cut clear off from the head. The core boxes like Exhibit P, that I saw at Mr. Long's when I came there in December, 1918, had pieces very similar to P-1 and P-2. That was the first time I had seen that box. As near as I can guess, the two pieces we have here were no different from the ones in the old core box—it is just the same as this is. The groove on the side of the core box, below the part that takes these lugs of the piece P-2, is merely to hold the ribs P-1 and P-2 in position.

The reason the core box has the name "Levett Co." on it is because Mr. Levett put his name on all of the—in all of our core boxes that we shipped to them—just to identify his own castings. Walker M. Levett Company was a foundry, in New York City, and we shipped patterns to that Company. We shipped those patterns to him and he made the castings according to the patterns that we shipped him.

(Pistons Exhibits B, E, F and G are placed before the witness.)

This Exhibit B here: I recognize that as the piston used by the Franklin Company, before they used the

piston Exhibit F, which was made and patented by Mr. Long, known as Series 9.

This Exhibit E is a Series 9 Franklin piston, made from dies owned by Mr. M. K. Weems, and these castings were also made by Walker M. Levett Company.

Exhibit G is a Franklin piston, also known as the Series 10. This casting evidently came from the Franklin factory, or from Mr. Long.

Mr. Richey: The last part of the answer is objected to as argumentative and incompetent.

Mr. Bruninga:

Q. 125. Is Exhibit G a piston made by Weems? A. We make the same identical piston as this Exhibit G.

(Narrative continued) Weems makes Series 10 pistons of the same dimensions, practically the same design, only the slots opposite the wrist-pin boss run at an angle, like those in Exhibit E.

Referring to the kind of a mold that the piston Exhibit F was made in, it was made in a wood pattern and in a wood core box. The designation F.1.B., inside, was a factory mark that we put in our pistons to identify it further than the Franklin piston; to be used for factory convenience, only. It was a Series 9 Franklin piston.

Q. 131. Is that particular piston, Exhibit F, any different from the one that you saw at Mr. Long's in December, 1918?

Mr. Richey: I object to that as leading.

Mr. Bruninga: Do you want me to ask him whether it is the same?

Mr. Richey: No; you should have asked him in the beginning to compare it with the piston, but now you have led him, and of course you will get the answer that you want.

(Narrative continued) There is practically no difference between the pistons.

Q. 132. Were any pistons being made at Mr. Long's place, when you came there in December 1918, like Exhibit F?

Mr. Richey: That is objected to as leading.

(Narrative continued) Yes, sir, they were being made and put in some cars, and there was a number of them sent out for trial, to different places. I couldn't

recall just where they went to. I wouldn't say I know of any of these pistons, like Exhibit F, being made at the time that I came with Mr. Long in December, 1918. It is pretty hard to go back at that time, to be exact, to the exact design. I started working on pistons right away after I came to Mr. Long. We made an aluminum piston for Franklin cars and some for the Northway Motors. The design was practically the same as Exhibit F. Of course, they were made according to the sizes and lengths and so on, according to the factory's blue-prints.

Regarding the construction of the pistons I worked on, when I came to Mr. Long in 1918, some of them had the two ribs cast with the wrist-pin boss on one side, and not on the other side. That would allow the piston to be slotted on one side, practically the same as this one is, and no slot on the other side.

I don't know how long the wrist-pin bosses have been relieved as in Exhibit F, but it has been done ever since I knew anything about gasoline engines. That relief is put in there to keep the piston from scoring. The piston expands more than the wrist-pin does, in the line of the wrist-pin, than it does the other way. Naturally, if the pistons fit close, they are apt to score the cylinder. That was true of the ordinary trunk piston.

Mr. Richey: You mean, iron pistons?
By the Witness: Yes, sir.

(Narrative continued) That was done in trunk pistons, before I came to Long. My experience with automobiles and gasoline engines runs back to about 1909, and during that time I have worked on a good many engines and in most cases they were relieved on the side.

In Exhibit F, the groove or slot below the lowest ring land runs all the way around the piston; this was done for the convenience of machining. It was not necessary, so far as the piston structure was concerned, but it was easier to cut this groove all the way around, than it was to saw those side walls loose from the head. The purpose of the saw cut or the cut around the piston is to get the side walls loose. The practice of making that circumferential cut or slot was accomplished with a cut-off tool, in a lathe; a tool practically the same as you cut your ring groove, only a narrower tool. The reason we did not cut it part way around, just opposite these parts that the webs are connected with in Exhibit F, is that if

you cut it part way around that would answer the purpose, but it increases the cost of making the piston, by a separate operation for cross-slotting.

The change over to pistons like Exhibits E and G was made sometime in 1920, as near as I can remember. We had some metal molds made by the Walker M. Levett Company, about then. I wouldn't say positively on that date. By "we" I mean that was made by Weems; that Mr. Long was entirely out of it at that time. Mr. Long had no interest in Weems' business at all, after he sold out. As far as the making of pistons was concerned, we had to comply with his patents, as near as we could. He was paid a royalty on the tenth of every month, from the time Mr. Weems took his business, until it expired. I know that to my own knowledge. He was paid twenty cents per piston.

The reliefs in Exhibits E and G, opposite each wrist-pin boss, were cast in there. In Exhibit F they were cut at the time the piston was machined. The cut was made with a small tool, with a cam action. This tool would come down and cut a distance, and then turn it over and cut the other side. That was while I was still with Long, that we made the first cam action cut. I can notice evidence of such action on Exhibit F. It is the tool marks. By noticing this closely, you can see the feed of the return of this tool.

In Exhibit E, near the lower ring land, the skirt deflects inwardly, and has some oil holes. That inward deflection was just an offset put in there to give us a position to drill our oil holes. That was the purpose of the same deflection in Exhibit G, also.

In Exhibits E and G there are three ribs across the head, while in Exhibit F there is only one rib across the head: That was done to strengthen the piston on the inside, because we had some trouble with breakage on this Exhibit F.

I can produce a core box that was used between Exhibit F and Exhibit E. (Witness produces core box.)

Mr. Bruninga: The core box produced by the witness is marked for identification, "Defendants' Exhibit Q."

(Narrative continued) This Exhibit Q was a core box for a piston for Series 9 Franklin cars, and was started by Mr. E. C. Long. This core box was finished, after Mr. Weems bought the business this core box was finished. I

obtained it in our own shop, the shop formerly owned by Mr. Weems. It has been in the shop since about 1920; since it was returned from Walker M. Levett. This particular core box, Exhibit Q, was sent to Walker M. Levett. It forms the core for the inside of a piston, and I don't think it was ever used before it was sent to Mr. Levett.

Q. 173. Can you sketch out briefly the procedure that is followed by a core maker, in making a core with this box, Exhibit Q?

Mr. Richey: That is objected to as immaterial.

A. Yes, sir.

Mr. Bruninga:

Q. 174. Please do so; just very briefly state how a core maker would make a core with this box.

(Narrative continued) Well, with this box here, it would be all put together, because this makes a complete core. He puts this core box together and fills it with sand; separates it, and the core sets on the end. It is baked in one piece. It makes a Franklin Series 9 piston. The inside is very similar to the one in Exhibit E.

The small piston you have handed me marked on the inside "O. 1. A" is the type piston made for an Oldsmobile car or Northway Motor.

Mr. Bruninga: The piston is marked for identification as "Defendants' Exhibit R."

(Narrative continued) This is a sand cast piston. Mr. Long had one of those, or some of those castings were pistons for the Northway Motors, when I went to work for him—they were in process of machining. I wouldn't say positively whether they were completed or not, but they were in the process of machining at that time, and later there were some of them shipped to the Northway Motor Company. That was shortly after I came with Mr. Long. I don't remember just exactly, but shortly after. In the course of, I would say, two months. Those pistons that we shipped to the Northway Motors were very similar to piston, Exhibit R. Their structure, with the exception of the cross-web to hold the side walls, the same as Exhibit R. It had six vertical slots, very much like Exhibit R.

The designation O. 1. A. is just to identify this particular casting, for our own shop convenience. This particular piston bears the designation "M. K. Weems";

I couldn't tell you just exactly when that was made, but, of course, this particular piston was not made by Mr. Long. That was only a stamp that was on top of the piston to identify that it was made by Mr. M. K. Weems. That piston was used in Oldsmobile Six. It was made right around war time. I know, at the time I went to Mr. Long there was one or two of these motors at the shop at that time, having some work done on them. I won't say whether they had pistons in them or not, because that I don't know.

The designation "2.774" on top of piston, Exhibit R, signifies the size of the piston; that is the diameter in inches. The designation "5" indicates the cylinder that it fits in.

I can make drawings, and I have made drawings with Mr. Long and Weems.

Mr. Bruninga: I hand you a tracing marked "Oldsmobile Six." I will have this marked for identification as "Defendants' Exhibit S."

(Narrative continued) This is a tracing I made for an Oldsmobile Six piston, the same as in Exhibit R. There is a little difference in the piston R than the drawing S. In the top of the piston, on the inside, the drawing only shows one rib. (After examining piston.) I was under the impression that this piston had the three ribs in the top, that we later put in. When I picked it up I found there was only the one rib in this. This drawing was made for the piston as Exhibit R. After Mr. Weems took the business over some pistons like Exhibit R were made; but before Mr. Weems took it there was an Oldsmobile piston, for a Northway eight motor, which was a little different than this piston, as that bore of that cylinder is two and seven-eighths in diameter, and there was a little difference in the depression, that is, the distance between the wrist-pin boss and the top of the piston. So far as the slot and the web were concerned, the construction was just the same.

I made the drawing, Exhibit S, after Weems took the business. I couldn't say just how long after. I should judge we sold probably one hundred or one hundred and fifty of those pistons like Exhibit R, after Weems took the business. That runs from 1920 to 1930.

(Witness is handed tracing, marked for identification "Defendants' Exhibit T-3.")

This is a tracing I made for a Ford, Model T. Weems made some of those pistons, but we never made a great many, because they were too expensive to put in Ford cars. We sold some of them, back as far as 1919. That tracing was made sometime after Mr. Weems had taken the business, around—well, I'd say, in 1920, because most of these drawings were made up shortly after Mr. Weems took the business.

Those Ford pistons were made of aluminum alloy; an aluminum alloy piston was made from this drawing.

(Witness is handed a tracing marked for identification "Defendants' Exhibit T-2.")

I made this drawing near the time the Ford piston was made; in fact, we made up a number of these drawings and had patterns made for them, and made a little stock of pistons for these cars. That was the Essex, Ford. Aluminum was the metal used to make them. We sold some of these pistons in the years ranging from 1920 to 1930, probably. There was pistons in stock like that, a very short time ago. I don't recall how many Essex pistons were sold.

Regarding the other automobiles other than the Olds, Essex, Ford and Franklin, that Weems made aluminum alloy pistons for: we made up about eighty different patterns and core boxes, as far as slotted skirt pistons, same as shown in Exhibit R, in such cars as Hudson Super Six, Stutz, Marmon, McFarland—in fact, all cars that were made at that time. We did have a Chalmers Six, about 1920, and we had a Maxwell, but I don't believe that we have got a Maxwell, a drawing of the Maxwell piston, because that piston and core box was made in Mr. Long's time. Mr. Long made that box and piston himself. It was not necessary for me to make a drawing for it. I haven't a drawing of the Chalmers; there was some of those pistons that we made later, that I didn't make a drawing of.

Weems made no pistons other than the six slotted, cross-web construction; only a few cast iron pistons, for special jobs, such as tractors and stationary engines. It would be hard to say how many different kinds of pistons of the six slotted, web construction, Weems made in 1920. Some of the cars he made pistons for, in 1920, were Oldsmobile, both six and eight; Franklin cars, Series 9 and Series 8, and in 1920, we made a piston for Dusenberg, four-cylinder racing car.

(Witness is handed drawing, marked for identification "Defendants' Exhibit T-3.")

I made this drawing in 1920. The piston for the Dusenberg was made from this drawing. I couldn't say how many of those Long, six-slotted pistons with the cross-webs in them, Weems made during 1920. We made quite a lot of them; in fact, our shop at that time—we were very busy on making pistons.

During the first part of 1920 there was only about five men employed in the shop. Or rather, there were three men and two boys. One was an apprentice and the other was just a handy man. That was besides myself; I was still superintendent, in 1920.

Our capacity per day was very small at that time, because we was not hardly fixed to make pistons. But we did manage to turn out quite a—tool up a few with our common engine lathes. Most of the pistons that we sold we sold to Franklin dealers throughout the country. The dealers I remember was the Franklin Motor Company in Chicago; and there was a number of pistons—quite a lot of them—sold to the Franklin dealer in St. Louis; in fact, there was a number of Franklin dealers all over the United States who bought pistons from us at that time. We also had a customer in Wichita Falls, Texas, that bought lots of pistons from us. Their business started early in 1920, and continued along for a number of years.

Q. 244. And those were all of the six-slotted, cross-web type like these exhibits that are before you on the table, Exhibits E, F and G?

Mr. Richey: That is objected to as leading.

A. Yes, sir; they were all made of that type, because that was the only pistons we made, was the pistons with the six slots.

(Narrative continued) Mr. Long was being paid a royalty on every one at that time. We have been making Long pistons up to, I will say, the first of the year. Since then our shop has been shut down.

Yes, there were some of those six-slotted, cross-web type pistons, shipped to the Maxwell Company. I can't recall the dates, now, I don't remember whether we shipped any to the Chalmers Company.

I should say Weems made several thousands of those Long pistons in that period before he died. According to the old books, from about January, 1919, to July—I

forget just what year—1924, we made about fifty thousand dollars worth of pistons.

Mr. Richey: I object to the answer as testifying to the contents of records.

(Narrative continued) I made a check-up of the Weems business before I bought it; I knew pretty well what the business was, being with it from its infancy. Weems did some advertising. He advertised in Motor Age, and a few other trade papers; I don't recall just what they were, now.

(Witness' attention is called to the July 7th, 1921, number of Motor Age, page 124, containing an advertisement entitled "The 'Long' Type Non-Expanding Aluminum Alloy Piston. M. K. Weems, Licensed Manufacturer.")

This is an advertisement by the Mr. Weems whom we have been talking about, and I recognize it.

Q. 255. Of what kind of a piston is the advertisement?

Mr. Richey: That is objected to, as the advertisement is the best evidence.

(Narrative continued) Well, that has the appearance of a Franklin piston. That cut was not used in Mr. Weems' other advertisements. As I remember, this cut here was made by the Motor Age, themselves.

Mr. Bruninga: Page 124 of Motor Age, is marked for identification as "Defendants' Exhibit U."

(Narrative continued) I have some books of the Weems Company, which I brought with me. I came in possession of those books, (which are marked for identification as "Defendants' Exhibits V, V-1, V-2, V-3, V-4, V-5, V-6, V-7") when I bought the business from the Weems estate.

Exhibit V is the book of inventory, stock of machinery and parts and materials, pistons, finished and unfinished, that were in the shop when Mr. Weems took possession. A man by the name of Royalty, made out the inventory. I don't remember his first name. Yes, it was Sidney. He is now located at Jacksonville, Illinois. He was with Weems when Weems took over the business; before that he worked for Mr. Long. I don't know just how long. He was with Mr. Long at the time I was with him.

I can identify Exhibit V, that particular book. I had nothing to do with the taking of the inventory, however. I recognize Mr. Royalty's handwriting, and to my knowledge, it is Mr. Royalty's handwriting in that book.

Q. 273. Page 28 of that book bears the following notations:

"4 Hup pistons nearly finished.
8 Maxwell pistons 14½ lbs. aluminum.
11 Holmes pistons 19¾ lbs. aluminum.
5 Hup pistons ⅞ finished.
4 Overland 13 casty's 5¾ lbs. aluminum.
4 Hup pistons 5 lbs. aluminum.
16 Northway pistons almost finished.
24 Aluminum pistons Packard twin six 38 lbs.
6 Franklin Series 8 pistons 12½ pounds.
1 Ford aluminum 2."

Page 29 bears the following designations:

"4 Overland finished aluminum complete pistons Fin. goods 20.00.
10½ lbs. finished Franklin pistons .21 Fin. goods.
65 patterns & core box for pistons, etc. 3.00 patterns 195.00."

Have you any recollection, yourself, about those items, as to whether or not they were in the shop at that time?

Mr. Richey: I object to the question as leading.

A. Well, they were in the shop at the time the inventory was taken, and there is some of those patterns there yet.

(Narrative continued) The statement "65 patterns and core boxes for Pistons" refers to such as the Franklin and Maxwell and Oldsmobile, and these various types of pistons such as Exhibits E and R. There were a few other type pistons, a few patterns there for iron pistons used in stationary engines and tractors. The "4 Overland finished aluminum complete pistons" has reference, I think, to an Overland. That was a piston with the six slots. The "10½ lbs. finished Franklin pistons" refers to the six slot pistons. The "16 Northway piston almost finished" refers to six slot pistons of the same type as Exhibit R.

The "Aluminum pistons Packard twin six," item 47.50 were pistons made for the six slot type, for test purposes, for the Packard Company. They were shipped out to the Packard Company—if I remember right, I think we just turned those pistons back to Mr. Long and he took care of that shipment himself. Judging from the price, $47.50, I imagine they were partly finished.

The eight Maxwell pistons, shown on page 28, were of the six slot type, too. The Hup piston—I think that was an iron piston that was there. I think all three items referring to Hup pistons were all iron pistons. The one Ford aluminum piston was of the six slot type, the same as Exhibit R.

Defendants' Exhibit V-1 is a cash book; in other words, it is a book that shows what we bought in the way of castings; also what we sold in the way of castings. The book was kept by a Miss Landon. Her first name was Anna. I don't know exactly where she is, but I think she is in Davenport, now. She is married, and I do not know her married name; I have not seen her for at least four or five years. She kept the books from the first of November, 1919, until about 1921—I don't know the exact date that we made the change, but she was with us probably about two years. I am familiar with her handwriting and would say that most of this book is in her handwriting. I think there are some items in the back of the book that was written by one of the other girls that came later—a Miss Erke. I cannot think of her first name, but she is in Denver. I do not know her address. I wouldn't swear to her handwriting, because there was two or three other girls that followed her and I couldn't tell just when she did make entries in the book.

I am familiar with this book, Exhibit V-1; I saw Miss Landon keep the book, and make the entries. The item, on page 3, "Walker M. Levett Co. 164.03" refers to some castings of the Long type piston, because that is all we had made—castings we had made by Levett. Another item on page 3, on November 28, 1919, "Walker M. Levett Co. 316.33"; that was for aluminum alloy pistons. We did no other business with Walker M. Levett Company, except for aluminum alloy pistons. The handwriting on those two items noted, under November 10 and November 28, 1919, is Miss Landon's.

Another item for December 6th, 1919, on page 7 of Exhibit V-1, "Walker M. Levett Co, 243.13," is for cast-

ings. Those other items on page 6, under dates of December 8, December 12,—those are all for aluminum pistons castings.

I can remember that those castings were coming through at that time from Walker M. Levett Company and being sold, and shipped out to these different dealers. Those castings were machined in the shop, and the pistons were of the six-slotted type. Walker M. Levett Company made no other castings for us, except for the six-slotted type, until later years; not up until 1925. We got some plain aluminum pistons, such as used in the Reo cars, of the solid type.

On page 7 of Exhibit V-1, under December 6, 1919, is the following entry: "E. C. Long Royalties for sales pistons 27.40"; that item was the royalty that we paid Mr. Long. We paid him that royalty each month; between the first and tenth of every month.

The items on the following pages:

"Page 11, January 6, 1920, E. D. Long, Royalties 24.00;

Page 15, under date of February 7, E. C. Long, Royalty 80.60;

Page 19, March 3, E. C. Long, Royalty 127.80;
Page 25, April 9, E. C. Long, 157.60;
Page 31, May 10, E. C. Long, Royalties 106.40;
Page 37, June 8, 1920, E. C. Long, royalties 138.40;

Page 41, July 8, E. C. Long 117.80;
Page 47, August 7, E. C. Long 96.40;
Page 53, September 10, E. C. Long 151.60;
Page 57, October 9, 1920, E. C. Long 87.20;
Page 63, November 10, 1920, E. C. Long 103.40;
Page 69, December 10, 1920, E. C. Long 69.20;
Page 73, January 10, 1921, E. C. Long 71.80."

These were all royalties that were paid Mr. Long at the rate of twenty cents apiece for each piston. The items are in Miss Landon's handwriting. Mr. Long was paid twenty cents a piston royalty between the first and tenth of each month, on the pistons manufactured. The way we did that, you know, at the last operation that the piston went through, we had that boy keep a record of every piston. That was turned in to the office and that was what Mr. Long collected his royalty on.

On page 18 of "Defendants' Exhibit V-1," an item under March 12, 1920, reads, "Franklin Motor Car Co.

So. Bend, Ind. 327.62"; that represents pistons that were shipped to the Franklin Motor Car Company at South Bend. I have no recollection, other than the records on the book, of that shipment; that is all.

Mr. Richey: I object to the testimony as incompetent.

(Narrative continued) On page 24 of "Defendants' Exhibit V-1," under date of April 9, 1920, is the item, "Northway Motor & Mfg. Co., Detroit 35.70": that represents the pistons Mr. Long started there in the shop and we finished them up and shipped them to the Northway Motor Company. I do not know anything about the notation above the 35.70 that looks like L 8. I have a recollection of that transaction, independently of that record, however. I remember of making up those pistons and that we had some trouble in getting wrist-pins for them, and we had the Northway Motor Company send us wrist-pins for them. That is one thing that makes me remember this particular shipment. They were the pistons with the six slots, similar to this Exhibit R.

On the same page, 24, there are two items under date of April 19, 1924, "Franklin Ross Motor St. Louis": I can remember that transaction. We shipped those—we shipped quite a lot of pistons to Franklin Ross at St. Louis. They were Franklin Dealers at that time. They sold the Franklin car, here in St. Louis.

On page 14 of "Defendants' Exhibit V-1," under date of February 5, 1920, is an item "Chas. L. Bartlett Jan. Acct. 141.03": according to my recollection of that transaction, we reground the pistons in that car and fit them with a set of these six slot pistons—we reground the cylinders; fitted the cylinders with six slot pistons. The Long six slot pistons. I recall that transaction independently of this record, because I bought the car afterwards. I bought the car in about 1920—I think it was about in October, if I remember right.

On page 58 of "Defendants' Exhibit V-1," under date of October 21, 1920, there is the entry, "Chas. Bartlett, Local 1420.00": That transaction was the sale of a new car. I remember that transaction myself, independent of this record. The entry on October 22, 1920, of "Chas. Chadwick 750.00" was the cash payment on that Bartlett car, by myself. The pistons in that car were the six slot Long type piston.

"Defendants' Exhibit V-2" is kind of a ledger, is what you would call it, of the M. K. Weems Company. It was kept by Miss Landon.

Under Account No. 31, consisting of five pages, there are entries under the heading "Sales Pistons": Those represent the sales of the pistons, that is, the sales were lumped altogether. It just shows the amount of pistons that were sold each month, and for a period of months. That is Miss Landon's handwriting there, and that is not (indicating on book). This is her handwriting (indicating on exhibit book); but this item does not apply to piston sales, this particular part right here (indicating on exhibit book). The dates are June 30 and July 31, 1921.

The section entitled "31 A," one sheet, entitled "Sales Iron Pistons" relates to iron pistons; some of those are re-sale pistons, pistons that we bought in a semi-finished state. Account No. 31 all relates to aluminum pistons, of the six slot pistons, Long type. I think that these items were taken from another book, and this J, I imagine, means the journal. I do not have that Journal—that book has been destroyed. We had that book until probably six months ago, and we wanted to use the ledger itself, and we just opened it up and shook all the leaves out in the paper basket, and they were burned. I have investigated and found that is what became of the book.

Under Account 44, in "Defendants' Exhibit V-2," is a series of entries, beginning with November, 1919, to July 31, 1921, entitled "Cost of Pistons Sold". That relates to the Long type pistons entirely, and is in Miss Landon's handwriting.

Exhibit V-3 is a book of purchases, book of entry of purchases, of different things, such as castings and repair parts, and things of that kind. There are a number of entries in this book, "Walker Levett and Co.": Those were all for piston castings. Those were the only transactions we had with Walker Levett Company, for castings and for molds for piston castings.

"Defendants' Exhibit V-4" is an entry book consisting of sales, costs, factory expense, and such items. The item on page 6 of this book, under date of December 31, 1919, reading, "E. C. Long Chas. Bartlett for 6 pistons @ 9.80; 6 wrist pins @ .80 and 18 rings @ .80" was for pistons we put in that Franklin car that I purchased from Mr. Weems, that he took in trade with Mr. Bartlett, about which I previously testified.

On page 10, under date of January 23, 1920, is an item under "Advertising E. C. Long, Giving Mr. Long Cost price on pistons etc. used in Mr. Chas. Bartlett's car"; this car was tore down at the time Mr. Weems bought the business, and Mr. Weems made those pistons for Mr. Long at practically cost price.

On the page opposite page 1, of "Defendants' Exhibit V-4," the statement reading, "Started new system piston manufacture Aug. 17, 1920. Had men come to office for a short meeting so as to give them better understanding of our methods," is in Miss Landon's handwriting. She referred to the time when we started on our new tooling process making pistons at that time. We got our automatic tooler up and a new way of boring wrist-pin holes. We felt we were really in production at that time. That was for principally Franklin pistons of the Long type. We made some other—no other type, with the exception of for the various cars; all of the same type pistons, only being made for different cars, under different specifications.

I don't know who put "Did not keep this Up," there. It is not the same handwriting as the other.

I think we had about ten men employed in the shop at that time, working on pistons and other work, too. We had four men working on pistons practically all the time. I don't remember our daily output about that time, August 17, 1920.

The book handed me, marked for identification "Defendants' Exhibit V-5," is a daily time book. It starts out in Miss Landon's handwriting, on page 1. The entry of Charles Chadwick refers to myself. S. D. Royalty is the entry of the man I previously referred to, and "Anna M. Landon" was the one that kept the books. Louisa Rogers was a stenographer at that time.

The book handed me, marked for identification, "Defendants' Exhibit V-6" is a daily time book, from March, 1921, to August 5, 1922; it is a continuation of "Defendants' Exhibit V-5."

"Defendants' Exhibit V-7, dating from August 5, 1922, to December 22, 1923" is the time book from August 5, 1922 to December 22, 1923. It is a continuation of "Defendants' Exhibit V-6."

My only knowledge of Edward J. Gulick, who at one time resided in Elkhart, Indiana, is only just through the patents of his pistons; that is all. That is the only thing I know about him.

As far as I know, Edward J. Gulick or the Aluminum Company of America never offered me, or Long or Weems, any piston which would function in automobile engines, nor did the Cleveland Trust Company ever do that, as far as I know. All I know is that Gulick got a patent; that is all. I seen it in the patent records; that is all. I believe I have met the Mr. McCoy who is in the room here, before. I think he came to Quincy one time, and he looked over the piston shop. I don't believe he told me who he was representing. I didn't know then that he was representing the Cleveland Trust Company at that time. I don't recall the name of the man with him. I could describe him; he was tall and slender, and he had dark hair. He was the man who cross-examined me in Detroit, at the time of taking testimony there, in one of Mr. Long's interferences. Mr. Watts; I believe that is the man.

They talked of the construction of the piston, and I believe they brought up the Oldsmobile Eight piston. That is the one we talked of mostly at that time. They did not tell me that they were collecting evidence to be used against Mr. Long; not when they were in Quincy. They did not tell me that they were collecting evidence against me or Mr. Weems, for a possible suit. I showed them around the shop—I don't think there was anything they missed. I think I showed them about everything there was. But neither of them told me that they were attorneys representing somebody else. I just thought maybe they were interested parties, interested in our system of manufacturing pistons. Yes, I had shown a number of other people through the shop; showed them our equipment for turning out pistons, which we were very proud of at that time, and, naturally, we wanted to show it to every one. Some of them came in to be curious and some would be salesmen from outside.

And thereupon, the further taking of the deposition was adjourned until April 29, 1932, at 9:30 o'clock, A.M.

Met pursuant to adjournment as above, on April 29, 1932, at 9:30 o'clock A.M.

The following proceedings were had:

Mr. Bruninga: I offer in evidence "Defendants' Exhibits O, P, Q, R, S, T-1, T-2, T-3 and U."

(Narrative continued) The books I have produced here, "Defendants' Exhibits V, V-1, V-2, V-3, V-4, V-5, V-6 and V-7," are all the books that I have been able to find, of the Weems business, so far. I have looked for other books, but they have been destroyed. I uncovered them, or found them, just within the last week. I don't know just really what was lost; they were just put in different places where they would be out of the way, and there was no occasion to move them. They were practically lost for a while, because they were covered up with other—. I have no bills, or checks, or other data, relating to the matters given in these books. As to the procedure, in keeping these books, practically all the entries in those books is as to shipments made, or charges growing out of that, that was given in by myself and Mr. Royalty, at that time. Mr. Royalty had charge of the Service Department, and I had charge of the machine shop.

About the matter relating to these Long shipments, when we shipped out Long pistons; we had what we call a requisition, and we would make out the requisition and turn it in to the office, for pistons and other materials. Of course, those requisitions were destroyed after Miss Landon made the entries in her books. I made out the requisitions, as far as the Long six slot pistons were concerned, and I gave them to Miss Landon. During the latter part of 1919, beginning with the time that Weems took over, to and including the year 1920, and the part of 1921, up to the time that Miss Landon left, I was in close contact with the situation, particularly with reference to Long six slot pistons. Occasionally I referred to the books, myself. I never had occasion to check them, to see whether the entries were properly made. Of course, at times they would ask me about certain parts, charges, that I had to rearrange my requisition; but I was in close contact with all the office work.

Referring to the transaction about the Bartlett automobile, which I purchased later on, the core box used in making the cores for those pistons, was an old wooden core box. There is no core box before me, that those pistons or cores were made from.

I remember Mr. Long going to Syracuse during the time I was with him, and prior to the time that Weems took over the business. That occasion was in March, 1919, or the early part of 1919. I remembered about it because one thing that impressed me more than anything

else was that Mr. Long was at Syracuse, and he telephoned me to make him up some more pistons and send them for trial. They were the six slot kind of pistons (indicating exhibit) like that Exhibit F.

Yes, I have heard of Mr. Gunn, of the Packard Company—or, I couldn't say whether his name was Mr. Gunn or not, but I remember one of the Packard men being in the shop there, that was around with us for some little time. I remember there was pistons shipped to the Packard Company, but I couldn't relate any dates on that. They were the six slot pistons. That was the R pistons (indicating Exhibit R). I don't remember whether that was before or after Mr. Weems took over the business.

These pistons, Exhibits E, F, G and R, have a relief space in the region of the wrist pin bosses: Those relief spaces were always put on there, on the six slot cross-web Long pistons, while I was with Weems. There is no time that we ever made any pistons that that relief was not put on, either cast in the molds or cut after the pistons were turned.

I remember, very definitely, a Mohrenstecher car; it was a Franklin, Series 9; one of the first Series 9 models. I think it was made in 1916.

Mr. Richey: I object to that part of the answer that says it was made in 1916, as being hearsay.

(Narrative continued) I have been familiar with Franklin automobiles since 1918, in December, was my first experience with any Franklin Service. I had seen Franklin automobiles and driven them before that. I had seen a 1916 Franklin automobile before that time, yes, sir. I saw a 1916 Franklin shortly after it was put on the market.

The Mohrenstecher car was a car that had given a good deal of trouble. I worked for Mr. Mohrenstecher after Mr. Weems had bought Mr. Long's business, and made an agreement with him to take that car out to our place and recondition the cylinders and put in a new set of pistons, for just actual cost, because Mr. Mohrenstecher had so much trouble with his car that we felt like we were doing him a favor by making this free service.

Q. 461. What did you do?

Mr. Richey: I still object to the testimony regarding the trouble with this car as hearsay.

A. We ground the cylinders, and we fitted it up with pistons, the same as Exhibit F.

(Narrative continued) That was done some time in 1920. We took some pistons out of the car—not exactly like this; they had a U-slot on one side and a T-slot on the other side. I imagine it was a trunk piston. There was not much difference between that and the present piston, that is, on the inside. The horizontal part of the T was right up under the—just below the first ring land. The vertical part of the T was in the center of the skirt, that is, opposite the wrist-pin boss. I mean between the wrist-pin bosses, opposite, not along the line of the wrist-pin boss. And on the other side was a U-slot. There was two slots up the side and then across, but the slots didn't go the full length of the skirt of the piston.

(Witness is handed photostat marked for identification, "Defendants' Exhibit W.")

Those six figures represent just a common trunk piston. The piston that I took out of the Mohrenstecher car was very much the same as the piston shown by Exhibit W, with the exception it had a rib extending from the side wall of the piston to the wrist-pin boss, on one side, and nothing on the other side. That was the piston I took out. I could make a sketch, on Exhibit W, showing any differences, or any additions, on the piston taken out of that Mohrenstecher car.

(Witness makes sketch on Exhibit W, as requested.)

I have indicated only the changes, on Figs. 1 and 4. Those slots extended all the way through the piston wall. I testified that that piston had a web on the inside, but I didn't show that. I will show that on Fig. 6 (sketching on exhibit). I have sketched a web on Fig. 6 and also a web on Fig. 5; there was just a single web in that piston. That web connected on the side that showed the T-slot. I can sketch it, also, on Fig. 4, where that web was. (Sketches on Exhibit.) I have shown two webs extending from one side of the piston, in Fig. 4, and only one web, in Fig. 5; it is only on one side of the piston, but there were two webs. I mean, it was only one side of the piston, from the wrist-pin bosses to the piston wall. That was the construction of the piston that I took out of the Mohrenstecher car. The condition of the pistons was not so bad, but the condition of the

cylinders was terrible. It was such a poor job boring the cylinders, that it was impossible for the piston to function properly with the cylinder in that condition. The cylinder was bored tapered. As for the pistons, I believe there was two or three of them that was scored, but at the very top of the piston, back in the ring lands; the rings was stuck tight in the piston, and one or two of those cylinders—I don't remember whether it was one or two, but I am positive there was one of them. The pistons were junked; they were thrown out in the junk pile. I don't know where they are now. I have looked around and tried to find something—some of those pistons, but, of course, that has been a long time ago, and all that stuff was evidently taken out. Those were the only T-slot pistons that I remember and could identify. That was in the year 1920, that I took those pistons out of the Mohrenstecher car, and I put in pistons like Exhibit F, yes. The pistons that I put back in, worked fine. I kept track of the car for quite a while. We kept a check on the car for some time after. I don't know who put those T-slot pistons in Mr. Mohrenstecher's car. I didn't put them in, and they were not put in while I was with Long. I know, because if there had been I would probably have made up the pistons, or they would have been made under my direction, because everything that was made in the shop went through my hands.

Mr. Bruninga: I offer in evidence, "Defendants' Exhibit W."

Mr. Bruninga: That is all.

Cross Examination by Mr. Richey.

I couldn't tell you the exact date of this telephone conversation with Mr. Long, from Syracuse, in March, 1919. I wouldn't swear to the part of the conversation about Mr. Long saying he wanted to show those pistons to Mr. Stellman. I don't remember whether he said he wanted to show them to Mr. Stellman. He said he wanted them for test purposes at the Franklin plant. I sent two sets, twelve, as near as I can remember, and they were like Exhibit F, here.

Mr. Long took some of the pistons with him when he went to Syracuse, like Exhibit F. I would not say positively how many he took, but I know he took a set, enough to equip a motor with—that is six. I don't remember the exact conversations we had when he came back from

Syracuse, any further than that the test was very satisfactory at the factory. I don't think he said that he had shown Mr. Stellman any of the pistons he took with him, but I don't remember. When he talked to me over the telephone he did not mention any particular parties he had shown the pistons to, further than the engineers of the Franklin Company. When he came back he confirmed that, but did not mention the names of the engineers—he might have, but I would not say positively the names of the engineers, at all. I don't remember whether he said he had shown them to anybody except the engineers of the Franklin Company, either over the telephone, or when he returned. I don't remember that part of it.

I shipped these Exhibit R pistons to the Packard Company for the purpose of having them test them out. To my knowledge they never adopted this piston, and we never sold any of them to the Packard Company. I don't remember whether those pistons were shipped to the Packard Company before or after Mr. Weems took the business.

We also shipped some of these six-slot pistons to the Northway Motor Company and to Maxwell, I think at that time, the Chalmers Company. I can't recall any others now. The Maxwell Company did not adopt this piston as standard equipment, and neither did the Northway.

The pistons used in the Mohrenstecher car were aluminum pistons. That was one of Mr. Long's designs, made prior to this six-slot piston. I saw other designs of pistons made by Mr. Long. There was a number of pistons around there that Mr. Long made for customers. Some were slotted one way and some another, and hard to be described, the different ways the pistons were slotted. I saw a number of different designs of pistons that Mr. Long had made—they were around the place there, when I went there.

Part of the trouble with the pistons in the Mohrenstecher car was, of course, piston slap, because the cylinders was so large at the bottom that the piston naturally would be loose at the downward stroke of the shaft. You bring the piston down where it couldn't help but rattle. There was piston slap and piston sticking at the same time. Kind of a double evil affair, yes, sir.

The pistons didn't seem to be collapsed—the piston seemed to be in perfect condition, with the exception of

one in particular. The cylinder was so much smaller at the top that when the piston would go at the top it would stick in the top of the cylinder and naturally it scored the piston at the ring land. In that way it tightened the rings in the piston, and the rings couldn't expand out along the cylinder wall.

Some of the other designs of pistons I saw around there at Mr. Long's, except the six slot piston, had evidences of scoring. I seen some of them that we put in and made trials with and taken out, and they would be scored on the side, and some would even be practically melted, in places. Mr. Long made many efforts to get a satisfactory aluminum piston before he got to this six-slotted piston. In his experiments he made a number of different kinds, of different shapes, and a number of them I saw around there.

I would not say they all showed evidences of failure until this six-slotted one, because he had some there that he made tests with, that didn't show any particular score or damage to the piston after it made the run. But a good many of them did.

I saw them put in just one piston. They removed one cylinder and installed the piston in there to make a test, and then took it out to see the results. This was not a block test. In the Franklin motor you can remove one cylinder and not interfere with the rest, and in that way they could install the piston and go out and make the test run with it and come back. We finally settled on this six slot piston and the only car manufacturer that adopted that was the Franklin—and the Holmes adopted the same piston. I don't know just how long Holmes used it. They failed a good many years ago, and I know they used it up to the time they failed.

I spoke of seeing iron pistons that had a relief around the bosses; that was to keep the piston from scoring the cylinder due to pin expansion. It would expand the piston more if they ran with the wrist-pin, than it would the other way. The piston was originally fit with a clearance, but you have to allow more clearance on the side than you do the other way. You have to do that because if the pin if fit tight into a piston—of course, take a piston with an oscillating pin, that doesn't make so much difference, but a pin that is fit absolutely tight in a piston, and loose on the connecting line, there is no way for that to slide on the wrist-pin, due to the expansion, and the result of it is that it forces that wall out. The

cylinder wall is expanded, too, but doesn't get the extreme heat that your piston gets. So, even when there is an iron piston and an iron cylinder, there is danger of the iron piston expanding out and scoring the cylinder, and for that reason this relief was put in.

I couldn't say the exact number of aluminum pistons with slotted skirts the Weems Company made and sold in the year 1919, or anywhere near it. In the year '19, we took that business at such a late time that there probably was not more than maybe one hundred pistons made in the year 1919. That is just what Mr. Weems did; I don't know how many Mr. Long made and sold. In the year 1920 the Weems Company sold in the neighborhood of a thousand pistons. There were several years there that we ran along pretty near the same. In 1921 we probably made a little more than that; we probably ran—that would run three or four thousand, I guess, in the second year. Let me see: 1921 and 1922—that was when we had the biggest run on those. We had about the same run in 1921 as in 1922. In 1923 that began to slow down a little bit at that time. I couldn't tell you just how many pistons we made that year. That is hard to remember. It naturally began to go down a little, because we were not getting as much of the cylinder grinding shipped to us from all over the country, that we had in the early part. 1921 and 1922 were our biggest years.

Yes, during those years there were millions of pistons being put in motors, both in original installations and replacements, so that what we sold was a mere drop in the bucket. I should judge that a great number of those millions of pistons sold from 1920 on, were aluminum pistons, sold by others. A great many of them were sold to the car manufacturers from 1920 on, in original installations.

I don't know who sold these aluminum pistons. There is a number of different kinds of pistons that was in the automobiles that I couldn't tell you anything about who made the pistons, unless I took one of them out of the car, but I remember seeing the Lynite pistons, and that was about the—I know they were Lynite, because I know they had a terrible black eye. The Lynite was a trunk type piston, and they never were successful until they put a slot up the side; but after they were slotted they were successful.

The trouble with these trunk type aluminum pistons that were such a failure, was that they had such an un-

usual clearance that when the motor was cold they would slap and make a terrible noise, and then when the motor would warm up they would expand more than the cylinder wall, so much more that they would stick in the cylinders.

I did the red ink work on the drawing, Exhibit O, yesterday morning, in Mr. Bruninga's office. It was made for the purpose of my examination. Mr. Bruninga asked me to sketch this drawing to show that the ribs could be added to a trunk type of piston, and also add these slots to it—that was the purpose in my making the drawing.

Referring to those particular pistons on counsel table (Exhibits E, F, G and R), I seen E and R and the F pistons before, because they were made by myself.

XQ. 81. Well, when you say that, you just say that you made all these pistons, and therefore you made these, but I am asking when do you have any distinct recollection of having seen them, independent of any argument that you must have made them?

(Narrative continued) The first time I seen them was right here in the office—that was when I came in Tuesday. I saw Exhibit R about two weeks ago, when Mr. Wilkinson, or his man, brought that from Hannibal up there and showed it to me. I saw both Mr. Bruninga and Mr. Wilkinson, his assistant, at Quincy about two weeks ago. That was the first time I saw this Exhibit R; they brought it up there and showed it to me.

Neither Mr. Bruninga or Mr. Wilkinson told me that if I saw you or Mr. McCoy, or anybody representing the plaintiffs in this case, that I was to refuse to answer any questions that I was asked. Nor did they tell me that I was to reply to anything that you asked me, by telling you that I would answer that question on the witness-stand.

I have been stopping at the Mayfair, here in St. Louis. Mr. Stellman is not, to my knowledge, stopping there.

Referring to this core box, Exhibit P: Mr. Long had that box made up. It is one that he left there at the place. Evidently that box had been shipped to Levett, and Levett always put his name in his castings. I don't know when it was shipped to or back from Levett. It has been at Quincy ever since Mr. Weems took the business over, in December, 1919. That was among the patterns that came to us, and it has not been shipped down to

Mr. Levett since then. I don't know how long it has been since this core box was used—it has not been used since Mr. Weems took the business.

These holes that run through the box, from the bottom of the slots, is just a convenience for the core maker to make the—to get the core out of the box.

The Levett Company was in the business of making aluminum pistons during the time the Weems Company was making and selling pistons—we got pistons from the Levett Company as long as they were in business. Levett and Company also sold aluminum pistons to the trade in general.

In connection with Exhibit T-1, I said that this six slot piston, shown in Exhibits E, F, G and R, was too expensive for the Ford. It cost us too much money to make it. We had no dies for making the piston, and we had to pay a dollar a pound for the metal, and the piston casting itself cost about two and a half dollars. By the time we machined them, it made the job too expensive for the average Ford owner.

Referring to this slot—horizontal slot—under the bottom land, Mr. Long and I worked that out together. That is, cutting the slot all the way around was worked out by he and I before I went there with him. I had not done any work with him on it before I went there. The design of these six slot pistons, as we have here—Exhibits E, F, G and R, was not entirely completed until after I went to Mr. Long's place. They had the ribs in them as they have them now, but we made some little changes in cutting the groove around, to make our machining a little easier. We also made a metal core box, after I went to work on it with him, that showed three ribs in the inside, at the top of the piston, instead of one like is in Exhibit F. I have named practically all the changes that I made in pistons like these exhibits after I went to work for Mr. Long. There were no other changes made further then when they had the dies made, of course, naturally, we cast the relief, so we would not have to cut that relief after the piston was machined. That is all the changes I remember at present, but I would not say that was all of them.

We began to make the pistons with the three ribs and the head, like shown in Exhibit E, let me see: If you take core box, Q, we started before Mr. Long left, that is, before he sold the business to Mr. Weems, and we finished it up after Mr. Weems took the business. Just

how much Mr. Long had done on it, I couldn't say now. But we didn't make them with the three ribs and head until after Mr. Weems took over the business.

I can't remember the exact time Mr. McCoy and Mr. Watts came to see me in Quincy, because I have nothing that makes me remember that date.

Yes, I said I was very open with them, and showed them everything regarding these Long pistons. I was very proud of our process of machining and was glad to show it to anyone who came along. I did not show them these books, Exhibits V to V-7, or either of the core boxes, Exhibits P or Q. They did not tell me that they represented any interest that was hostile to us. I don't think anybody has said anything to me about your representing hostile interests to this time. I knew, when I was on the stand in Detroit, that Mr. McCoy was for the Aluminum Company of America, but I never knew it until I met him in Detroit—I mean Mr. Watts. Since then I have produced these books and these core boxes. They have been in the building and have been in my possession all the time.

XQ. 130. Mr. McCoy and Mr. Watts talked to you and Mr. Weems both, didn't they?

Mr. Bruninga: That is objected to, because Mr. Weems is dead.

Mr. Richey:

XQ. 131. Mr. Weems was present at the conversation, or some of it, was he not?

Mr. Bruninga: Same objection.

(Narrative continued) Not to my knowledge. They talked to me out in the shop, and I wouldn't say positively whether they went to the office or not. That I couldn't positively say, because I didn't go to the office with them. Everything I told them then was true, as near as I—I had no occasion to tell them anything but the truth.

I know an attorney in Quincy, named Lancaster. I don't think I went to Mr. Lancaster's office with Mr. Watts, Mr. McCoy and Mr. Weems. I don't think I did; I don't remember that I did. I don't know whether they went to Mr. Lancaster's office, either.

Mr. Bruninga: Has counsel another affidavit that he is going to flash?

Mr. Richey: Have we flashed an affidavit in this case, yet? You said "another."

Mr. Bruninga: I am talking about affidavits in other proceedings, that have been flashed by witnesses.

Mr. Richey: What other proceedings?

Mr. Bruninga: Interferences involving the Long and Gulick application; flashed by Mr. Gilbert, and carefully worded so as only to include his own company and not his predecessor.

Mr. Richey: Do you want that in the record?

Mr. Bruninga: I do want that in the record.

Mr. Richey: We object to counsel testifying; he is not under oath, and is manifestly testifying to something that is hearsay with him, and we also deny the statement that he makes.

The record in the interference proceedings will show that Mr. Gilbert was called and testified.

Mr. Bruninga, you have reference to interference numbers 49,569, 49,570 and 49,571?

Mr. Bruninga: I do not know what interference it was. At the proper time it will be introduced.

Mr. Richey: You have made charges here and it is up to you to make them definite.

Mr. Bruninga: At the proper time they will be made definite.

Mr. Richey: I produce the interference records in which Mr. Gilbert testified on behalf of the party, Gulick; these are the records that were used in the United States Court of Customs and Patent Appeals, and ask that they be marked for identification, as "Plaintiffs' Exhibits 1 and 2."

(The record in Case No. 2608 was thereupon marked "Plaintiffs' Exhibit No. 1" and the record in Case No. 2609 was marked "Plaintiffs' Exhibit No. 2.")

Mr. Richey: I will state that these are the only two that I have any recollection of ever having examined Mr. Gilbert in, and unless counsel for the other side is pettifogging, I invite him to point out where we at any time flashed this so-called affidavit of Mr. Gilbert, in his examination.

Mr. Bruninga: Counsel admits he made a mistake. What I had in mind was the affidavit signed by Albert R. Bush, as to a transaction of the Bush

Foundry & Metal Wheel Company of Quincy, Illinois, as distinguished from the predecessor of the Bush Foundry & Metal Wheel Company, in Interference 49,571, Long's record, pages 198 and 199; Long's record in that interference, pages 193 and 201.

If we both have it out of our systems, I will wipe it out, or let it stand.

Mr. Richey: We will let it stand.

Mr. Bruninga: Are you willing to stipulate the pages of that testimony that I just referred to?

Mr. Richey: No, not alone; not without the entire record. I will put in the whole record, in the other cases.

Mr. Bruninga: No.

Mr. Richey: Mr. Gehr was the cross-examiner there, and I do not see anything at all reprehensible, or to be criticized, about his confronting the witness with an affidavit on cross-examination. As I understand that, it is perfectly proper procedure.

Mr. Bruninga: Counsel may think it is proper procedure, but I do not.

Mr. Richey: I am not willing that part of the record should go in; I think the whole record should go in. If counsel intends to make any charges, I think, in fairness to Mr. Gehr, the whole record should go in, and that charges should not be made on one or two pages of the record.

(To Mr. Bruninga): Is that all?

Mr. Bruninga: That is all.

(Witness is shown drawing patent to Long, No. 1,489,499, dated April 8, 1924.)

(Narrative continued) I saw some pistons like that at Mr. Long's place of business, when I went to work there. I don't remember whether or not I made any pistons like that after I went to work with Mr. Long. I would not say how many of them I saw when I went to work for Mr. Long. A number of them were laying around there. I could not even express the number. There was not a hundred; I would say there was four or a dozen, but I saw several pistons around there that were slotted in that way, and some were slotted different. There were some of these pistons, like shown in the drawing of this patent, there when Mr. Weems took the business over. I don't think they were included in

the inventory, only just as scrap. The pistons very similar to that, is what we took out of the Mohrenstecher car. The slots I don't think were just exactly the same as they are there.

I never made any entries myself in these books, Exhibits V to V-7, that I testified about. There was none of those pistons in those books that referred to anything other than the six slot pistons. There is no reference in the books to one kind of piston, as distinguished from another kind. I am not testifying what kind of pistons those items mean, from my recollection; we were licensed, under Mr. E. C. Long's patent, for this particular design, and nothing else. There is nothing in these books to say what kind of piston it was, further than our agreement with Mr. Long, which—I have not got the agreement with me now—will state the design of the piston. The books don't say anything further than these were pistons we actually were to manufacture under the—.

XQ. 151. I understand that. You argue from what you claim about that, that that is the only piston you made, and that is what the books mean? A. Yes, sir.

XQ. 152. But that is not what I am asking you. A. Well, we were not allowed to make anything else.

XQ. 153. People sometimes make things they are not allowed to make. A. We couldn't, in this case, because our contract bound us to it.

(Narrative continued) I have no independent recollection of having seen any of these entries, regarding these pistons, made in any of these books. I couldn't point out any particular time that I seen one there.

Our agreement with Mr. Long licensed us to make pistons on any design he had made up to that time, but it doesn't allow us to make anything, and improvement that he may have done afterwards. I don't think we were licensed, under that agreement, to use any of his inventions and improvements in aluminum pistons, that he had made up to the time of the agreement. My recollection is that it was limited to this particular six slot design.

XQ. 158. But you would not be willing to say that it was not broad enough to cover such designs as shown in Patent No. 1,489,499, that I showed you? A. Yes, it was.

XQ. 159. Well, now, you want to change your testimony. You said a minute ago that it was limited to the

six slot piston; now you say it was broad enough to cover— A. I misunderstood the question, but we were confined to the six-slot piston; that was the object of making a drawing for every piston pattern that I had made.

XQ. 160. You say it was limited to the six slot piston? A. That is right.

XQ. 161. And did not include anything such as shown in Patent No. 1,489,499? You could not have made that if you wanted to, under that agreement? A. No, sir.

XQ. 162. Your license did not give you the right to do that? A. No.

XQ. 163. You are certain of that? A. I am certain of that.

XQ. 164. You would say that that agreement contained no such licensing clause as the following; "The party of the first part (that is, E. C. Long) grants unto party of the second part (that is, M. K. Weems) the right and license to make, use and sell for use in engines, automobiles, and motor vehicles, pistons embodying the invention and subject-matter of each and all patents now owned by him and of all patent applications now on file, whether allowed or not"? You say that agreement contained no such broad license clause as that? A. That is all right; that is in the agreement all right, but afterwards he confined us to this particular piston.

XQ. 165. When did that take place, afterwards? A. Well, that was immediately after the transaction was made.

XQ. 166. That is, you are trying to say there was another agreement that limited you to the six slot piston? A. Well, I don't know whether it was a verbal agreement or whether it was a written agreement.

XQ. 167. But you say there was another agreement, in addition to the main agreement? A. The agreement that Mr. Long and Mr. Weems and myself had at the time, that he would not allow me to make a pattern for a piston, without making a drawing, without sending it to him first. That was the object of these tracings that we have here.

XQ. 168. But you don't deny that what I read for you was in the original agreement? A. No, I don't deny that.

Mr. Richey: That is all.

RE-DIRECT EXAMINATION by Mr. Bruninga.

(Narrative continued) I have an original of the Weems agreement, at Quincy. I knew about the agreement at the time it was made—the agreement was read over to me by Mr. Weems at the time.

I saw the agreement after it was signed, and I know Mr. Weems' signature. The agreement you have handed me (marked for identification "Defendants' Exhibit X") is the one about which I have been testifying, and that is Mr. Weems' signature. I will let Mr. Richey and yourself see my copy of the agreement, the original agreement, any time you want to see it.

Mr. Bruninga: With consent of counsel, I offer in evidence a photostat copy of that agreement, identified by the witness, as "Defendants' Exhibit X."

Mr. Richey: We make no objection to the introduction of a copy, if we can have access to the original, and can correct any errors that may be found in the copy.

Mr. Bruninga:

RQ. 8. In Mr. Richey's cross examination, with reference to the Mohrenstecher car and the pistons that you took out, he asked you a question whether it was not a double evil affair: Was there anything the matter with those pistons you took out?

(Narrative continued) There was nothing particular the matter with the pistons; it was mostly all the cylinders. Only one of the pistons in particular was scored. That was scored at the top of the piston. To my recollection, none of the skirts of those pistons were scored. I have seen good pistons get scored in automobiles, on account of something else than construction of the piston; lots of them. Lack of oil is the principal cause of scoring—and untrue cylinder walls.

Weems made no other pistons at all except the six slotted web Long pistons—not from the beginning of his business up to, I will say 1925, he handled a few solid type, such as used in the Reo cars.

When I stated that in 1920 Weems made one thousand pistons, that was from memory; that is just a guess. We slowed down in 1923, I think, more than anything else, from the lack of advertising, and then, we didn't get as much of the grinding from that time on as we got before. The result of it was we couldn't furnish the

amount of pistons for that work. I don't know whether there was any patent trouble, but I don't think so.

In 1920 Walker M. Levett made a piston casting that he shipped to any one and every one that wanted it. That piston was turned up and slotted afterwards. It was slotted with just one slot down the side, the extreme length of the skirt of the piston. I have seen some of those pistons, and know they were successful. They were not slotted singly, like one of the slots in Exhibit B; the slot extended from the lower ring land of the piston, the extreme length of the skirt. There was just one slot. That is all I remember about piston types in 1920. Those pistons was in continuous use right straight along up to the present time. We had nothing to do with any other piston in 1921, except that single slot skirt piston. As for 1922, we never had any further dealings with any other piston except the Long type piston and the piston slotted with the single slot on the side. There was other pistons made, but we never had anything to do with those.

Outside of furnishing me with the original drawings, no one helped me to make Exhibit O. I put in the lines indicating the slots—the ribs connecting the side wall of the piston to the wrist-pin boss. That drawing was made to show that just by adding two ribs, adding the ribs extending from one piston wall to the other, the piston could be slotted in six slots and still stay together. That piston, Exhibit O, with the red line on it, was very similar to the piston that I saw when I came to Long. It was no different, further than different dimensions, was all. There were different cars.

I do not know William Venner, and have never talked to him that I know of. Nor have I talked to Mr. Stellman, nor to Mr. Long since I have been here. You never told me to talk to any one, but not to talk to any one. You did not tell me not to talk to these particular attorneys here. I don't know whether you told me not to talk to any parties who might be called as witnesses.

Mr. Mohrenstecher is in Quincy now. He is bedfast and has been for probably a year. He didn't bring the car over. They just brought the cylinders and the old pistons and rode to the place. I took them back.

As to the kind of piston Ford was using in 1920, 1921, and 1922; Ford never put in anything but cast iron pistons in the model T Ford. We sold Ford pistons. We sold Ford the pistons complete for one dollar and a quarter.

When I came to Long in December, 1918, the six-slotted web piston I saw there at that time was identically the same as Exhibit F. The piston that I took out of Mohrenstecher's car—the inside of it—was identically the same as this drawing shows here, but this shows a U-slot on both sides of the piston. But the piston that was taken out had a U-slot on one side and a T-slot on the other side.

When Mr. McCoy and Mr. Watts came over to see me at Weems, in Quincy, they did not ask for any books. I was not in the habit of showing the books to visitors. They didn't ask to see the core boxes. They looked at the pistons that were in the machining process and that is what I thought they were interested in, was the process of machining. I was not particularly in the habit of showing all our core boxes to visitors, in those days, but I had no secrets. When they would come along and ask me anything about those things, I would tell them.

(Witness' attention is called to the following statement in "Defendants' Exhibit X"):

"It is understood that the following named articles are reserved to the party of the first part and not included in this sale, to-wit: One oak filing case, one electric ceiling fan, one Underwood typewriter, one old-fashioned mahogany table, one Burrough's adding machine, one special metal core box for Franklin pistons; also, other core boxes and patterns, as follows; for my patent pistons: One core box and pattern for Packard cars; one core box and pattern for Holmes car; one core box and pattern for Northway Motor Company; one core box and pattern for Overland Company; one core box and pattern for Maxwell car; one other special core box for Franklin pistons, and one three horse power Fairbanks Morse Company electric motor."

Those particular core boxes was the one we were making up here—"Defendants' Exhibit Q." We were making that core box at that time, and that particular core box, Exhibit Q, was reserved in this agreement. The core box and pattern for Packard cars was a similar type to the metal core box, Exhibit Q, but Packard dimensions, of the same construction. The core box and pattern for the Holmes car was also the same construction, as was the one for Northway Motor Company. The core box and pattern for the Overland Company was the same

that you have right there—the wooden pattern, Exhibit P. The one for Maxwell was also the same as Exhibit P. The special core box for the Franklin pistons was another experiment he was making at that time. I would not make an attempt to desqribe that, because I might be off on it. It is not included in any—I have that core box up there, but I would not attempt to describe it.

Mr. Bruninga: That is all.

Re-Cross Examination by Mr. Richey.

I don't know just what piston you have reference to, when you speak of the Levett piston. We got some of the pistons Levett made around 1919 or 1920, that had a single slot in them, because the trade demanded them and we didn't make them in the six-slot pistons, and so we had some of those pistons shipped in to us. And then we sold them. We sold them only as re-sale pistons; we didn't machine those. We sold various pistons as resale pistons, but no other aluminum pistons. Regarding the clearance we gave these Levett pistons when we put them in a car, we went according to the Levett's engineer's instructions on that, and if I remember right, their usual clearance was about one one-thousandths of an inch. What I mean by that, one-thousandth in diameter to each inch diameter; like a piston would be three inches in diameter outside, we would naturally give it three thousandths clearance. That is, three thousandths on the diameter. The diameter of these Franklin pistons here is three and a quarter, and we gave them a clearance of about two and one half thousandths. The Franklin Company gave them a clearance of three.

We substituted a good many of these aluminum pistons for iron pistons. They are better than iron pistons for the reason that the piston is so much lighter. It makes the engine operate with less vibration, and you can say a lot of things, but that is one of them. One of the big advantages to an aluminum piston, in case you would—the piston fit a little close and it would score the cast iron piston, it would score in the center as well as the piston wall, and the aluminum piston might score the piston, but would not injure the cylinder wall. Another thing, it was a better conductor of heat; the heat would go through the whole piston instead of—the head of the piston would become red hot, when the skirt would be practically cold in the iron piston. Carbon would deposit on the head and underneath the head, too. I have seen

carbon under the head, that would be one-half inch thick. We didn't have that trouble with the aluminum pistons. That is all of the advantages of the aluminum piston over the iron, that I can think of right now.

I testified before that we relieved all of these aluminum pistons, that I made when I was with Long or Weems, around the wrist-pin holes. I also testified in the interference of Frank Jardine and Ferdinand Jehle v. Elmer C. Long, No. 56,161, at Detroit, Michigan.

RX. 22. In that interference, did you not testify as follows:

"Q. 47. Will you tell us what you remember about this piston, speaking of the time when you were working for Mr. Long, in Quincy? A. While Mr. Long was at the Franklin factory—on his return—he gave me a blue-print of the Northway 8-cylinder motor—as to size. I took this print and changed it to our particular design, which is so constructed that the skirt of the piston is not round inside. In other words, the piston was larger through the wrist-pin hole than the thrust side of the piston. The object of this was to do away with relieving the piston. This I took to the pattern shop and had patterns made for it. Later the piston was sent to the W. M. Levett Company, of New York City, and there was a number of piston castings ordered—more than what we needed for the experiment. This was in case of a defective casting or if one was spoiled in making. The pistons were later machined and shipped out to the Northway factory."

I show you the printed record in that case, and ask if you did not testify like that.

(Narrative continued after witness examines printed record.)

Well, of course, on that particular piston—I have had that in mind all through this examination. It was only one of the pistons that we sent to the Northway factory. But I did testify that way. I don't remember what the date was that Mr. Long was at the Franklin factory. He went down there several times while I was working for him. He was at the factory several times, but I would not say it was one or two or a half dozen.

Mr. Long did not submit any other designs of pistons to me after he left Mr. Weems. He would come in and

show me other designs that he was working on, but I had nothing to do with those, except just to look at them. He was designing new types of pistons all the time.

Mr. Richey: That is all.

RE-DIRECT EXAMINATION by Mr. Bruninga.

Mr. Weems never made any of those Northway pistons about which I have just testified. He never made any of those pistons with the different thickness of piston wall. I couldn't relate back just what year it was that we bought and resold those Levett pistons, but I should judge that it was—it might have been 1925 or 1926, when we got the first solid type Reo pistons. It was later than any of these books shown here. By "these books" I refer to the various Weems books that I have produced here.

Mr. Bruninga: That is all.

Mr. Richey: That is all.

Mr. Bruninga: Deposition closed.

IT IS STIPULATED by and between counsel, that signature of the witness to the foregoing deposition is waived.

At this point a recess was taken until 1:30 o'clock P. M.

JAMES V. SAXTON, called as a witness on behalf of the Defendants, having been first duly cautioned and sworn, deposes and says as follows:

DIRECT EXAMINATION.

My name is James V. Saxton, and I am 66 years old. I am staying temporarily at 1237 Chouteau Avenue, St. Louis, Mo., and at present am unemployed. I cannot give you the exact date when I started working with A. Gilbert & Sons Brass Foundry, but it was in April, 1916. I worked there up to the time they went into bankruptcy, November 17 or 18, 1931.

I originally worked in the Machine Shop, kept track of the finished stock, and kept track of the castings that were sent there to be finished, assembled them and delivered them to the Shipping Room. That was what I started on. Then they discharged the pattern clerk and put me in charge of the pattern room. That was in

August, 1917, about the middle of August, I think the 14th. I know it was along about the middle of August in 1917.

Gilbert was doing casting of all kinds of metal—brass, bronze, aluminum; making solder, copper castings, aluminum castings. I cannot say that Gilbert was casting aluminum when I went there; he was casting aluminum when I became pattern clerk, to the best of my recollection. When I left Gilbert's, I presume there were about 30,000 patterns in that place, scattered all over the place. That is an estimate; I am not positive of that.

I was the pattern clerk, from 1917 on, had sole charge and kept the records. (Witness' attention is called to pattern marked D8764.) I recognize this pattern; it was obtained at A. Gilbert & Sons Brass Foundry Company, 4015-17-19 Forest Park Boulevard, St. Louis, Missouri. I know what bin it came out of; I got it out of the bin on the day Mr. Fletcher and I went out there. It was recently—the day I came to see you and we went out—I can't recall just the exact date. It was last week, to the best of my recollection.

I recognize this photostat, Defendants' Exhibit GG, D8764. It is in my handwriting, and was made out by me. This paper corresponds with the pattern you just exhibited to me; I obtained that pattern last week at Gilbert's, out of a certain bin there.

(Mr. Bruninga offers in evidence "Defendants' Exhibits GG and GG1." Also calls witness' attention to a photostat marked Defendants' Exhibit HH and which bears Pattern No. A640.)

I made out this paper while I was pattern clerk. The various dates under "Dates Received" on Exhibit HH designate the dates they came into the pattern room. "Dates Returned" designate the date they were returned to the owner. I made those entries at the time the patterns were received and returned respectively.

(Witness' attention is called to pattern marked "A640," "Defendants' Exhibit HH1.")

I recognize this pattern as one I obtained from A. Gilbert & Sons Brass Foundry Co. I found it in bin 398, last week. I cannot state positively the date. It came from the same bin as Exhibit GG1, and I got it at the same time. Pattern HH1 corresponds to the pattern noted on HH.

(Mr. Bruninga offers in evidence "Defendants' Exhibits HH and HH1." Also calls witness' attention to the photostat marked for identification, "Defendants' Exhibit II," and bearing pattern number B122.)

I made out this paper while I was pattern clerk at Gilbert's. The two patterns marked "B122," Defendants' Exhibits II1 and II2, which you call to my attention, were obtained by me at A. Gilbert & Sons Brass Foundry Company, out of bin 398, last week. The two patterns, Exhibits II1 and II2 correspond to pattern No. B122, or Exhibit II.

(Mr. Bruninga offers in evidence "Defendants' Exhibits II, II1 and II2.")

I made the sketches on Defendants' Exhibits GG, HH and II, when I got the patterns the first time. The dates under "Dates Received" signifies the time I received them in the pattern room, and "Date Returned" signifies the date I returned them to the owner. The "2" with the ditto mark immediately under "Date Returned" signifies that they were made at A. Gilbert & Sons Brass Foundry Company, and they are duplicates of the owner's original pattern—exact duplicates.

On Exhibit GG, "1 wood—C. B." signifies that one wood pattern and one wood core box were returned that day. On Exhibit HH, "1 wood—1 C. B." signifies one wood pattern and one wood core box owner's pattern and core box, were returned. Under "Date Received" of "2-22-19" on Exhibit HH, "4 wood—1 C. B." means there were 4 wood patterns and one wood core box received on that date here (indicating).

On Exhibit II under the date of 2-22-19, "1 wood—C. B." designates one wood pattern and one core box received. Under date of 3-21-19, "1 wood—C. B." designates one wood pattern and one wood core box returned to owner.

(Witness' attention is called to paper, marked for identification, "Defendants' Exhibit JJ" and marked "Pattern No. H4.")

I made this sketch the date it was received, October 10, 1919. Under "Special Identification," "1 wood" designates one wood pattern and one core box. That includes a core box; it is marked under "number of core boxes." I do not know where that pattern is now. The date 1-28-20 indicates the date it went back.

(Witness' attention is called to paper marked for identification, "Defendants' Exhibit KK," bearing pattern No. C123.)

I made out this paper while I was a clerk at Gilbert's, and I made the sketch on it. "1 wood" indicates one wood pattern and one core box. The core box is designated under "number of core boxes." "4 wood—1 C. B." designates 4 wood patterns and one core box. "1 wood—1 C. B. 3-21-19" designates 1 wood pattern and 1 wood core box returned.

(Mr. Brumings offers in evidence "Defendants' Exhibits JJ and KK.")

I made the drawings on Exhibits GG, HH, II, JJ and KK from the owner's pattern. I also made out the card marked Defendants' Exhibit LL. The number under the pattern number is B640. The designation on the card "Use pattern A640 as per instructions on core box" refers to, use this core box for pattern A640. Regarding the relation that A640 pattern has to Defendants' Exhibit HH1, that is the core box they constructed for use on pattern A640.

Exhibit LL bears the date under "Date Returned" of "3-21-19"; that designates that core box was returned to the owner on the date. The card was obtained from A. Gilbert & Sons Brass Foundry Company, but I do not know who obtained it; I did not take it from the files.

(Mr. Brumings offers in evidence "Defendants' Exhibit LL," and hands witness a card marked "Defendants' Exhibit MM," which bears the pattern number A641.)

I made out that card, and it refers to one pattern and one core box. I do not know what "Andy Watson, 1104 Chemical Bldg." refers to; it is not in my handwriting. The date "4-8-19" on Exhibit MM refers to the date the pattern and core box were received.

The designation "E. C. Long Mfg. Co." on Exhibits GG, HH, II, JJ, KK, LL and MM, refers to the firm owning the patterns. I have met Mr. E. C. Long. I know I met him once at the time of the transactions of these various Exhibits that I have testified to. I can't recall the exact date, but it was a number of years ago. It was in connection with those patterns I have talked about, and he came into the pattern room and wanted them cast as soon as possible.

Mr. Richey: I object to the part of the answer that says what Mr. Long wanted as being incompetent.

(Narrative continued) I don't recollect ever seeing a core box like Defendants' Exhibit P, which bears a plate on the back marked "0.13." I could not say positively that I have never seen that particular core box before. I can't say whether I recollect seeing a core box of that construction before, nor could I say how many patterns went through my hands from 1916 to 1931; there were thousands of them.

The core boxes that are referred to in the various Exhibits GG to MM inclusive, have been returned to the owners of the patterns. I do not know where they are.

Direct Examination closed.

Cross Examination by Mr. McCoy.

Referring again to Exhibit HH, one pattern was received from the owner and one received from the pattern room—Gilbert's pattern room. I can tell whether the pattern came from the owner or from Gilbert's pattern room. This one is Mr. Gilbert's (witness indicates word "Gilbert" as a special identification). This card indicates that on January 16, 1919 there was one of these patterns returned to the owners. Four wood were returned on March 21, 1919. The card indicates that the Gilbert pattern was left with the foundry and remained with the Gilbert Company after March 21, 1919. As to my independent recollection of the character of that pattern: The Gilbert pattern is a duplicate of the original pattern—an exact duplicate in every respect.

I do not know what the core box looked like that was originally received by Gilbert. I also do not know what the core boxes were like that were received as I have testified as indicated on Exhibits II, JJ, GG, KK, and have no independent recollection of the nature of the core boxes about which I have testified in connection with Exhibits LL and MM.

(Witness is asked to examine Exhibits HH to MM, inclusive, and tell which of the various patterns and core boxes indicated in these Exhibits remained with the Gilbert Company, and which are indicated as returned to the E. C. Long Company, or the party supplying the pattern.)

E640 was returned by Gilbert; that is Exhibit HH. E122, Exhibit II, two wood, retained by Gilbert; H4, there was no duplicate made on that. JJ was returned; D8764, Exhibit GG, one wood pattern retained by Gilbert—their pattern; C123, Exhibit KK, one wood and one core box returned February 6, 1919. There were four wood (I can't tell that date) four wood and one core box returned, March 21, 1919.

Referring now to Exhibit LL, the card indicates that that core box, No. B640, was returned to E. C. Long. That is the date the core box was returned—March 21, 1919. Regarding MM, that pattern was returned, but the card does not show what date it was returned. I know it was returned because it was not in the bin when I cleaned out the bin out there.

Since the time of its receipt on January 29, 1919, pattern D8764 has been in the possession of A. Gilbert & Sons Brass Foundry Co. The last time I saw that pattern prior to the time I located it last week for Mr. Bruninga, was at the time the castings were made and when I put the pattern away. I can identify this particular pattern, Exhibit GG1, as the particular pattern I saw at that time, because I made these numbers with an embossing machine, numbered and marked on here (indicating). That is my painting. I put that on Gilbert's pattern so there would not be any possible chance that this pattern would be returned to Long.

I don't know who obtained those cards about which I have been testifying this morning, but Mr. Fletcher inquired of me about these patterns last week, to the best of my recollection, when he and I went to the Foundry. I had not examined those patterns during the intervening time from 1919 and the other day when I looked at them.

Mr. Richey: You agree that that was Herbert G. Fletcher, who was attorney in the Long Interferences?

Mr. Bruninga: Yes.

(Narrative continued) These various patterns were used for making piston castings. I know enough about the foundry business to know that they were used for that. I recall using those particular patterns for making piston castings. That was on the card, at the time of receipt. That is not a deduction from what I see on the card; that is my recollection for the reason that we re-

ceived those patterns from Long with an order. My orders came from the office and usually the patterns were received with the orders and I got the order and marked up the casting card, stated how many castings were ordered, such and such aluminum, and pattern number on it, and the casting card, designated how many patterns and how many core boxes.

I did not make any of those patterns myself; the pattern maker made them. These records indicate what the patterns were used for. Insofar as the pattern record cards show, there is nothing to show they were used for making piston castings. All they do is make a cylindrical hole in the sand. It could be used for anything that would require that type of cylindrical casting cavity.

I was not asked to make any search for exhibits of this nature prior to the time that Mr. Fletcher inquired of me, a week or so ago. The first time I saw Mr. Fletcher he called me up; I can't just recall the exact date now. I have a little memorandum in my pocket he called up down there where I stay, and I did not put any date on it. I just put, Fletcher, 202 Title Guaranty Building. I can't state positively how long ago that was; it might be a week and it might be a little over a week. It is recently. That is the first time I ever saw Mr. Fletcher, to the best of my recollection.

I do not remember your coming to me and asking me for these pattern cards several years ago. I do not recollect getting out any cards for parties who inquired for them regarding the E. C. Long matter several years ago.

The cards shown in Exhibits HH, II, JJ, GG and KK came from the A. Gilbert & Sons Brass Foundry Company. I know because I recognize my handwriting and drawing. That is the only way I can tell, however. I may have got the cards out that are shown in Exhibits HH, II, JJ, GG and KK, but I don't recollect getting them out. However, I would not have removed the cards unless I had orders from the office, from Charles F. Gilbert, the President. I don't recollect Mr. Gilbert's asking me to get the cards out. He may have done so.

I can't say why the remaining cards LL and MM were not produced at the time of the production of Exhibits HH, II, JJ, GG and KK. To the best of my knowledge and belief, cards LL and MM came from A. Gilbert & Sons Brass Foundry Company, but I don't know who got them, or when they came from there. I recognize the

cards that remain in my handwriting—that's my handwriting (indicating). I don't recollect ever getting those cards, HH, II, JJ, GG and KK, out of the company records. I have no recollection of taking those cards out, but it is just possible that I did. I can't recall it now.

Cross examination closed.

Re-Direct Examination.

I placed the word "Gilbert" on Exhibit GG1, and the words "Gilbert Patt." on Exhibits HH1, II1 and II2. They designate made and owned by A. Gilbert & Sons Brass Foundry Company. I found those patterns in bin 396 and at the time I was out there with Mr. Fletcher. I knew without consulting any records what bin I could find them in from memory.

I know what a pattern for a piston looks like.

RDQ. 9. Do Exhibits GG1, HH1 and II2 look like piston patterns?

Mr. Richey: I object to that as calling for a conclusion and as being immaterial.

(Narrative continued) The yellow painted parts on these patterns are core prints.

Re-direct examination closed.

Re-Cross Examination by Mr. McCoy.

Regarding my search with Mr. Fletcher for these records, when I got out there they had a man in charge of the place and he did not seem to know anything about these patterns and I knew that some patterns made for Long, which belonged to Gilbert were still out there, then Mr. Gilbert himself came and I asked him if we could go in there. I also asked a young man who was in charge of the place under the Trustee whether I could go in there and look for patterns. He said yes, you can go in and I went direct to the bin where they were stored and I took my man from the floor, and Gilbert says, yes, those are the patterns, if Mr. Fletcher wants them give them to him, he did not care about them any more. Mr. Fletcher and I took them down town to his office then. There were none in that bin when we got there that belonged to Mr. Long but we produced all the patterns that were made for Mr. Long—all that we could find in that bin. We did not search any other bins; I had no recollection of any other bins.

That bin would contain all of the patterns that were made for Mr. Long by Gilbert Company in 1919, but there were patterns belonging to other people put in that bin since that time and there would not be sufficient room to put in all the patterns that we ever received from Mr. Long. I don't think the bin would have been big enough. It may have been at that time. They were crowded for room out there and there were more patterns coming in than going out and they were crowded and I put patterns in whatever bin I could find any space for them—in any bin that had sufficient room. Yet I did not search any of these other bins for patterns at the time I was out with Mr. Fletcher.

Re-cross examination closed.

Mr. Bruninga: Counsel understands that Mr. McCoy has the originals of Defendants' Exhibits GG, HH, II and KK and he is requested to produce same.

Mr. Richey: In answer to that, we will say we will produce them if we have them. We would have had them here today had we been notified in time to bring them along.

Mr. Bruninga: I did not know that Mr. McCoy had these originals or I would have asked him to produce the same.

Deposition closed.

Deposition of CHARLES F. GILBERT, taken in behalf of defendants, by consent of the parties, at 4069 Park Avenue, St. Louis, Missouri, on the thirteenth day of May, 1932.

CHARLES F. GILBERT, a witness of lawful age, being duly produced, sworn and examined, testified in behalf of the defendants, as follows:

DIRECT EXAMINATION.

I am Charles F. Gilbert, of St. Louis. I am 54 years old, and in the brass foundry business. We are a company at present, Gilbert Brass Foundry Company. Formerly, it was A. Gilbert & Sons Brass Foundry Company. Our present company is located at 4069 Park Avenue; the A. Gilbert & Sons Brass Company was located at 4017 Forest Park Boulevard. It was in that location from 1907 up until the present time. It is liquidating

now; it has not finished. It is a trusteeship, and was a corporation. I was President and Treasurer of that Company. I would say I still have relations with that Company, until it is completely liquidated. I have no control over the assets of that Company; it is in the trustee's hands. Karl Korngold is the trustee, and it went into trusteeship on November 19th, 1931.

I have none of the records of that Company, the A. Gilbert & Sons Brass Foundry Company, that I know of. The records of the old Company are in Karl Korngold's hands. I had access to them as long as the—just prior to the time at which we moved everything, which we purchased; not now, I have not. To the best of my recollection, I think I made a search of the records of that Company, with reference to transactions with Elmer C. Long, in 1926 or 1927. I am not sure just exactly what year it was. I made that search for Mr. Fletcher. I don't remember whether I made any for Mr. McCoy or not. His face is very familiar. Probably I did.

Mr. Richey: We agree that he did, and also it is agreed that Mr. Fletcher is Harbert G. Fletcher, attorney for Mr. Long, in those interferences.

Mr. Bruninga: That is right.

(Narrative continued) James B. Saxon was our pattern clerk in that Company, beginning, I would say, from along about in 1912 to 1931. He was with us up until we went into receivership—into trusteeship. He had charge of the pattern records and pattern room.

(Witness is handed photostats, "Defendants' Exhibits GG, HH, II, JJ and KK.")

The handwriting on these records is James Saxon's, and this is a photostat of a pattern record of the A. Gilbert & Sons Brass Foundry Company. I don't know whether I got them from Mr. McCoy or whether I got them from Mr. Fletcher or Mr. Long; I am not sure which. It has been some time ago. But I got them from one of them. I got the originals out of the records of the Gilbert Company.

(Witness' attention is called to "Defendants' Exhibit LL.")

I recognise that as a pattern record of C. E. Long, or E. C. Long, and it came from the pattern record of the A. Gilbert & Sons Brass Foundry Company. I took

it out of the records two or three weeks ago, and gave it to Mr. Fletcher.

(Witness' attention called to "Exhibit MM.")

This record I also took out of the records of the Gilbert Company and gave to Mr. Fletcher. I have not examined the records of the Gilbert Company to find any additional records of transactions with Long or with Mr. Long's Company, because that was all the card records that was left, and all the books are in the care of the trustee. I never had any access to the books.

I would say there probably are additional records, I don't know where you would be able to locate them now. I have searched for them, in the last couple of weeks. We had them in 1926, and I searched for them at that time. Exhibits GG to KK, inclusive, were turned over to them at that time. To the best of my recollection, that is all I could find at that time.

I should say that the books of the Gilbert Company, that show the names of the employees from 1916 to 19— have been destroyed. We never kept those records after five years. That is my best thought right now. I would say the records from 1914 to 1922, were destroyed; I haven't any. I do not know of any other records relating to the Long transactions with the Gilbert Company, unless the records—ledger sheets that have been transferred could be located, which are now in the hands of the trustee. I don't know where he has got them. As to the records dating back from 1916 to 1920, I would say they are all gone.

The location of the office of the A. Gilbert & Sons Brass Foundry Company was 4019 Forest Park Boulevard. It was there in 1926; prior to 1918 it was in a flat at 4019 Forest Park Boulevard, in a different building. It was a flat with the number of 4019 Forest Park Boulevard, up until 1918 or 1919, when we tore it down and built offices and moved our office to the second floor, that is, 4019 Forest Park Boulevard. The office was in the former location from about 1912 to 1917. After 1917, the flats were demolished and a new building was built, and the office was located in the second floor, 4019 Forest Park Boulevard.

I knew Elmer C. Long at that time. It has been a few years since I have seen him. When I first met him he was located in Hannibal, and later in Quincy. I saw him both at Hannibal and Quincy. I called on him and solicited his trade in both places.

When I called on him in Hannibal he was running a machine shop and making automobile parts. He was working on an aluminum piston at that time. The record here will show the type; the same thing—the same line as these records GG to KK show here, with exception of changing the core box from time to time.

I saw the pattern of the piston he was making when I saw Long in Hannibal; pattern and core box. The core box was a wood box, solid pattern, which was for the piston casting, which left ribs in the casting to strengthen it—left ribs on the inside of the casting. I don't recall how many ribs there were.

I can't describe that core box more fully other than that it had ribs in it, that is, it was made in such a way that it would leave the inside of the piston casting with ribs, which would leave a hub for the piston pin to work in, and ribs to strengthen it on the sides. The ribs couldn't be fastened on, because they had to be loose in there.

Mr. Richey: The answer is incompetent, a conclusion of the witness, and argument.

Mr. Bruninga:

Q. 76. You saw that core box, did you not? A. Yes, I did.

Q. 77. Did you see the parts in the core box, that made the ribs? A. I did.

Q. 79. Give me a complete description of the core box. A. In the making of a casting of that character, in order to core it or make it hollow, leaving those ribs in there, the ribs in the core box would have to be loose within the core box, so they could be withdrawn before the core is put together.

Mr. Richey: I want to object to it. I object to the answer as the witness' conclusion, and argument.

Mr. Bruninga:

Q. 80. What Mr. Richey wants to know is not what you think it ought to have, but what you actually saw that it did have. A. Well, it did have. It couldn't be otherwise.

Mr. Richey: Same objection.

(Narrative continued) I was familiar, at that time, with the core for an ordinary trunk piston. Such a core for a trunk piston had provisions for that kind of ribs,

extending across from each side of the core box. The piston casting, as made from the pattern of the core box furnished us by Long, left a hub in the upper portion, in the upper one-half, the solid end one-half, where the piston pin works in, and four ribs probably dropping down to about the same distance or a little further than the hub of the piston. Those ribs run from the inside of the piston wall to the piston hub, crosswise of the piston; no, not crosswise; it would be lengthwise in a piston. Those ribs connect with the hubs, and they extended from the hubs to the inside of the wall of the piston, to the skirt and head, both, as I remember it. It was attached to the head of the piston and to the sides of the piston.

We cast pistons for Long of that construction. I don't think it was prior to the time that I saw him in Hannibal. I think the time I made connection with Long was the first visit I made on him in Hannibal. That was along about 1912. We fooled around making piston castings from 1912 up until, I think, around 1919 or 1920.

Q. 94. Aluminum pistons?

Mr. Richey: I object to that question as leading.

A. Aluminum pistons.

Mr. Bruninga:

Q. 95. Did your company make any—cast any iron at all? A. None whatever.

Q. 96. What did you cast? A. Aluminum, brass, bronze.

Q. 97. You saw pistons at Long's the first time you went over there?

Mr. Richey: That is objected to as leading.

(Narrative continued) Not that I remember. What I saw was a pattern. That is my recollection. I did see some of Long's pistons complete. Just exactly when I couldn't say, because after he machined them up and experimented with them, if I remember correctly, at one time he was making them for the Franklin Automobile Company, and he brought some of the pistons back that we had made; whether it was for—I think it was due to excessive wear on them at that time—and wanted to know if we couldn't make a different composition of aluminum that would stand up better in service and we—if my memory serves me right, at that time were experimenting with a metal which we developed after-

wards, called aluminite, and from which we made some piston castings for Mr. Long and they gave much better service; that is to the best of my recollection. I prefer to keep the composition of that aluminite secret. We were using standard No. 12 at that time, in the original castings. No. 12 was supposed to run approximately ninety-two aluminum and eight of copper.

I stated that the best of my recollection was around 1912 that I first made piston castings for Mr. Long. Those pistons were for automobiles, and their construction was as described a few minutes ago, in the testimony—the ones with the ribs.

The year before the United States entered the war, the Gilbert Company was doing just a general brass foundry business. They did not work on munitions prior to the entrance of our country in the war. We did make aluminum piston castings for Mr. Long before the United States entered the war; from 1912 to 1917. We made them off and on, two and three times a month. They were of an experimental nature; nothing in the way of production. There were a half dozen or so at a time. This was on a credit basis, from the very beginning.

Up to a couple of weeks ago there were patterns for the Long pistons in the Gilbert Company place. I know because I went down and looked over the records and found two or three of them. I don't remember what bin it was. The card record, which was turned over to Mr. Fletcher, will show that. Those two cards were all that were turned over to Mr. Fletcher.

I saw those piston patterns myself before Mr. Fletcher took them out. There was someone with him, that located them—a pattern clerk, Fred Eyerkuss. Yes, Mr. James B. Saxon was there. He came there with Mr. Fletcher.

I think I would recognize the patterns. (Witness' attention is called to "Defendants' Exhibits GG-1, HH-1, II-1, and JJ-2".) Those are the patterns that were turned over to Fletcher. They were obtained from the Gilbert Company's place on Forest Park Boulevard, about two weeks ago. I have seen those patterns before; quite a few years ago. They are patterns for piston castings.

The yellow part on the end of these is the core print—the core box goes with that core print. Core boxes of that time were not located. I don't know where they are. They were the type core box which sand is packed in, that hollows out the inside of the pattern or casting,

to make it hollow. I don't remember particularly a core box for Exhibit GG-1; I remember that all of them had a core box with them. A core box, as I have stated, with the core print on the pattern coincides or fits the core box and the core is made in such a way that sand, when inserted, can drop down into the core print on the pattern, and when the casting is cast it leaves the casting hollow; and those core boxes had ribs on the inside, with also a lug where the—which formed a hub. I think there was one hub, or wings extending out from the hub, which made four divisions in the casting.

There is one hub in a piston, and it is used as a drill, to insert the piston pin. I would say the hub is located about one-third the way down from the top, at the closed end of the piston; in the center, from wall to wall.

(Witness' attention is called to "Defendants' Exhibit P.")

I have seen this core box before; as to whether there has been use made of it in any—whether we made any use of it or not I couldn't say just now.

Q. 141. What relation does that core box, Exhibit P, have to Exhibit GG-1, if any? A. The core box which makes the core, that you make the core in, and hollows out the pattern.

Mr. Richey: I object to the answer as incompetent.

(Narrative continued) I have been in this foundry business thirty-one years. I think I know a little bit about it; considerable about it. I absolutely was able to answer the last question.

Q. 146. What is the relation of the core print, of Exhibit GG-1, and the core box, Exhibit P?

Mr. Richey: That is objected to as incompetent.

A. The core print is a guide to insert the core in the mold and hold it in place.

Mr. Bruninga:

Q. 147. Do they fit or don't they fit? A. They do fit.

Q. 148. One is made for the other, is not that right?

Mr. Richey: That is objected to as incompetent.

A. One is made for the other.

(Narrative continued) We have recently made cores with Exhibit P, in this place. We made some yesterday, to make a casting from the pattern; this pattern here (indicating). We have some of those castings—Exhibit GG-1—on the floor right now; we can produce one of those castings. Here is one of the castings made from the pattern (producing casting).

This is the core box, Exhibit P. That casting was made this morning, in this place.

Mr. Bruninga: I offer in evidence this casting as "Defendants" Exhibit NN."

Mr. Richey: We object to it as immaterial. It does not matter what can be done today by using different core boxes or patterns or things of that kind.

Mr. Bruninga:

Q. 160. From your experience, would you say that Exhibit P was designed as a core box for the pattern, Exhibit GG-1? A. I would say it was.

Q. 161. How often would it happen that the core prints would correspond, if they had not been designed deliberately for one another? A. It would be a miracle if they did.

Mr. Richey: That is objected to as a guess of the witness.

(Narrative continued) The diameter of the core print bears no relation to the casting, as far as design is concerned. The depth of the core print bears no relation to the casting, but it does to the pattern to which it was made. The core print on the core box has to correspond to the core print on the pattern, that is, the core box has to correspond to the core print on the pattern. Usually, the man that makes the pattern makes them correspond.

Comparing Exhibit P with the Long core box which I previously described, it is identically as I described it in the other statement regarding the core box and patterns. I first saw a core box like the one exhibited here, or similar to it, back in 1912, in Mr. Long's place and at our foundry on Forest Park Boulevard, afterwards, when Mr. Long sent us a pattern down to have castings made from them. Mr. Long sent one core box with the pattern, but in his experimenting, while the pattern always remained the same, he was continually changing the core box on the inside. The change was in the way the ribs were inserted, the number of ribs. I was referring to

the removable ribs P-1 and P-2 when I made the statement about the core box, changing the ribs on the inside.

I don't think I could enumerate some of those changes, other than the core box came down to us with ribs in one way, and after he got the castings and experimented with them, they were not exactly what he wanted and he changed them and had other castings made. As to what changes he made in them I don't know. The fact of the matter is, that I never paid that much attention to it, further than to make the castings for him.

If those pieces were taken out and the holes filled up, that core box would be the same as an ordinary trunk piston, except it would not have any ribs on the inside. I saw a core box similar to this core box, at Long's place in Hannibal, in 1912. It had some ribs in it; whether the ribs were inserted just as they are there or not, I can't say. I couldn't say how early I saw a core box with ribs arranged like in Exhibit P, because I don't remember just exactly when I first saw the ones with the ribs crosswise, like that. I know it was before the United States entered the war.

The Gilbert Company made no die castings at that time, all sand castings. I say, no die castings; I experimented for years with die castings, but I have never done anything commercially with it.

That number, 0.13, is a number that was placed on there by our pattern clerk with a machine that we had for making such a number by zinc strips. From all indications, that strip was made at the Gilbert Company, because that is the way we numbered all our patterns; that is the kind of strip that was used. It was made by a machine especially built for embossing those letters on strips of zinc.

I know that a core box like Exhibit P was used at the Gilbert Company to make aluminum pistons, before the United States entered the war, for Mr. Long. As I say, we started to do business with Mr. Long about in 1912 and experimented with him on pistons from then on until '19.

We made five castings like Exhibit NN, here. We also have a core that was made with that core box; Mr. Fletcher has it.

Q. 191. Do you know whether any trouble was encountered in the making of that piston, Exhibit NN, with the pattern, GG-1, and the core box, Exhibit P?

Mr. Richey: I object to the question as asking for the conclusion of the witness.

A. None whatever.

Mr. Bruninga: Direct examination closed.

Cross Examination by Mr. Richey.

I think this Exhibit P, the parts there were in my shop prior to 1930. I am not positive; to the best of my recollection it was. From evidence of the pattern number on it, I would say it was just like it is here—parts and all. That would include these two removable parts (indicating on Exhibit P); otherwise the core box would not be complete. To the best of my knowledge, those two removable parts, P-1 and P-2, were in my place prior to 1930; to the best of my memory it was.

I said Mr. Long came in from time to time, in getting these castings made, in an experimental way; he was continuously changing his patterns, all the time we were making castings for him. The patterns remained just as they were; the core box was changed. There was no necessity for changing the pattern. The core box he changed from time to time. He some—took the core box that he had used in making one piston and modified it and had another one made. He was constantly putting the ribs in, in different positions and different shapes.

XQ. 14. You testified before, in these interferences, did you not? A. I think I did, yes.

Mr. Richey: Mr. Bruninga, you will agree that he testified in Interferences Nos. 49,569, 49,570 and 49,571?

Mr. Bruninga: Yes.

Mr. Richey:

XQ. 15. Before you testified in those cases, Mr. Fletcher talked to you, Mr. Long talked to you, Mr. McCoy talked to you, and I, F. O. Richey, talked to you? A. Yes.

XQ. 16. And we all asked you at that time to give us your earliest dates on these pistons of Long's, did we not? A. I am not sure whether you did or not, now.

XQ. 17. Some of us did? A. I presume so.

XQ. 18. Mr. Fletcher and Mr. Long were asking you for the earliest dates that you had made any of these castings; that is correct, isn't it? A. As to its correctness, I couldn't say. To the best of my recollection, those questions were asked with reference to that.

XQ. 19. And you were also asked by one or the other of those parties to search your records, to find

records of the earliest date of making any of these piston castings for Long; that is correct, isn't it? A. I think so.

XQ. 20. And you did make searches for such records, or had them made? A. I had them made.

XQ. 21. You didn't make them yourself? A. No.

XQ. 22. Whom did you have make them? A. Jim Saxon.

XQ. 23. He searched, and then brought in to you the earliest records that he could find? A. He did.

XQ. 24. Did not Mr. Fletcher at that time, or Mr. Long, ask you when you first made piston castings for Mr. Long? A. They probably did; I don't know. If my testimony shows it there, he did.

XQ. 25. In that case you testified as follows, did you not?

"Q. Did your company ever make any piston castings for E. C. Long or the E. C. Long Manufacturing Company? A. We did.

Q. What is the earliest date at which your Company made piston castings for E. C. Long or the E. C. Long Manufacturing Company? A. October 10th, 1919.

Q. In giving this date you have referred to some cards, haven't you? A. I have.

Q. What are these cards? A. Pattern record cards.

Q. Of your company? A. Of our company."

Later, it was shown that instead of October 10, 1919, that was October 10, 1918; that is right?

Mr. McCoy: October 16, 1918.

Mr. Richey:

XQ. 26. Then you were asked as follows:

"XQ. 34. Is it possible there are other record cards referring to the patterns received from E. C. Long or the company he represented, other than the record cards you handed to opposing counsel? A. None whatever, other than the records you have.

XQ. 35. But isn't it possible that you may have overlooked some? A. No."

Now, you so testified, did you not? A. According to that record, yes.

XQ. 27. You did so testify? A. Yes, I testified.

XQ. 28. The records that you had in mind at that time, when you said there were not any others, were these records GG to KK, inclusive? A. Whatever they are.

XQ. 29. Those records were given to us after the search you had made? A. I presume they were.

XQ. 30. That is a fact? A. A search had to be made for them in order to give them to you.

XQ. 31. Now, in the same interference you testified on behalf of Mr. Long, and were examined by this same Mr. Fletcher; that is correct, isn't it? A. I think so.

XQ. 32. In this interference, when you were examined by Mr. Fletcher, you were asked the following questions:

"Q. Do you recall whether about the year 1914, or prior thereto, that you made pistons for Mr. Long? A. To the best of my memory, it was around that period, around 1913 or 1914."

That was the way you testified, was it? A. I think it was.

XQ. 33. Did not Mr. Fletcher ask you, before he placed you on the witness-stand, what kind of pistons you made for Mr. Long in 1913 or 1914? A. I think he visited our place and asked—visited Mr. Long, and Mr. Long told him where he got the pistons made, and he came out and asked. He came out and asked us if we made aluminum pistons for Mr. Long, and I told him we did.

(Narrative continued) I don't remember whether I described the pistons to him or not, or whether I showed him the patterns and core box. I may have done both. I don't remember whether he asked me, on the witness-stand, what kind of pistons those were. Possibly I did tell Mr. Long, when he asked me to tell them what kind of piston I made for Mr. Long in 1913 and 1914, that I didn't remember. I couldn't say when I last talked to Mr. Long about this piston matter. Possibly the last time I talked with Mr. Long was at the hearing; along back in there. I don't remember whether that was around 1925 or 1926. I think it was in connection with these interferences.

I would hate to estimate how many different kinds of castings my company manufactured between 1910 and 1925. Many thousands. I believe I could mention any name—I believe I could come pretty near describing the class of castings and the character of castings which I have made for customers, back from the time I started. That is thirty-one years ago. Every year there were a good many hundred, if not a good many thousand, castings under my observation, and I can even call pattern numbers for you, mechanical electric—

XQ. 43. I didn't ask you for that. Pardon me, but we just want evidence that is competent in the case.

Mr. Richey: That is all.

RE-DIRECT EXAMINATION by Mr. Bruninga.

I have no interest whatever in this proceeding. I know what it is about. I know it is a suit pertaining to an aluminum piston—from Mr. Long and Mr. Fletcher, representing him. What the suit is about now, whether it is Mr. Long's suit, or some one else's, I don't know. In those interferences that Mr. Richey called my attention to, and I gave a date, for instance, of October, 1918, I gave that from the records. I understood I was giving it from records when I answered. The record was produced. I would say our pattern clerk made a good search of the records at that time, because I instructed him to do so. I thought the search had been made. I did not know that these two cards, Exhibits LL and MM, were in existence at that time, because I didn't know there were still any left in the files. When I personally looked, I found them.

I have spent my life in my business—thirty-one—thirty-two years. I started the business of the Gilbert Brass Company. I started it in March of 1900, and I would say that I keep close track of it.

Mr. Bruninga: That is all.

It is stipulated by and between counsel, that signature of the witness to the foregoing deposition is waived.

Deposition of SIDNEY D. ROYALTY, taken in behalf of defendants, pursuant to the annexed notice, in Room No. 1 Morrison Block, Jacksonville, Illinois, on the twelfth day of May, 1932.

SIDNEY D. ROYALTY, a witness of lawful age, being duly produced, sworn and examined, testified in behalf of defendants, as follows:

DIRECT EXAMINATION by Mr. Bruninga.

I am Sidney D. Royalty, of 231 Pine Street, Jacksonville, Illinois. I am in the automobile service business, and handle Franklin, principally. I have been in Jacksonville, this last time, since May, 1923. I am fifty-four years old. In 1910 I was working for Mr. Elmer C. Long,

in Hannibal, Missouri, selling automobiles and doing a little service work. Mr. Long was handling Maxwell automobiles at that time.

I was with Mr. Long for about a year, then I moved to Barry, Illinois, about twenty miles from Hannibal, where I went into the hardware and implement business. I was in Barry until the fall of 1916, then I moved to Quincy, Illinois, where I worked for the Electric Wheel Company, until February of 1918. On February 15, 1918, I went to work for Mr. Elmer C. Long again. I don't know of any particular way that reminds me to fix that date; of course, I had to notify the Wheel Company several days before I left them, and I just remember distinctly that it was in February, the middle of the month.

At that time, Mr. Long's place was at the corner of Twentieth and Main Street, in Quincy. Later in the summer he moved to Eleventh and Main Street. I worked for him until the fall of 1919, when he sold out to Mr. Weems, and moved away.

I continued with Mr. Weems, and I think I worked for Mr. Weems until the latter part of April, 1921. Then I came here to Jacksonville, and worked for Mr. C. N. Priest, who was handling Franklin automobiles. I did service work for Mr. Priest, the same as I did with Mr. Weems; Franklin service work.

I was with Mr. Priest until about March of the next year, then I moved back to Quincy and had a little shop of my own, during that balance of that year, 1922. The first part of January, 1923, I went to California and stayed there until the first of May, 1923, and came back to Jacksonville. I have been here ever since. When I went back to Quincy, I had a little independent Franklin Service station of my own. When I went to Barry, Illinois, in 1911, I used to come to see Mr. Long, in Hannibal. I think it was in 1913—1912 or 1913, I began to handle cars under Mr. Long, with a sort of sub-dealer's contract, and I used to see him about that.

I handled the Moon and the Oakland, through Mr. Long, and naturally I would have a little business with him whenever I would go to Hannibal.

Mr. Weems was making pistons, principally, when I was with him; aluminum pistons. They were called the Long piston; the piston designed or patented by Mr. Long. I first saw a piston designed by Mr. Long, about the year 1913, as well as I remember. While he was in Hannibal, I saw some pistons that Mr. Long had de-

signed. I was in Barry, at that time, and that happened about two years after I came to Barry, as near as I remember; that was before I left Barry.

The first piston I remember was a cast iron piston. The construction I remember mostly was slots in the piston. It had a slot resembling the letter T, on one side, and on the other side there was a letter U inverted, and this U had a slot running from the lower part of the skirt, almost half way up the skirt of the piston. That was a trunk piston with wrist-pin bearings; it was a solid—the skirt was in one piece, except for these slots. Those slots were located, with reference to the wrist-pin bearings, between them, between the wrist-pin bearings. I believe I could make a sketch of the piston I saw in 1913.

Mr. Brannigan: The sketch made by the witness is marked for identification "Defendants' Exhibit DD." I will mark on the sketch, above the first figure to the left, "Fig. 1," and on the next figure to the right, I will mark "Fig. 2."

(Narrative continued) Part "a" in that piston was the slot T; it was cut clear through the skirt wall. Part "b" in Fig. 1 is the head of the letter T; that, too, went all the way through the skirt wall. The slot, a, the best I remember, ran to the end of the skirt. I wouldn't be positive about it.

The heavy parts, e, represent the wrist-pin bosses. Line, d, represents the ring groove section. In Fig. 2, c represents a wrist-pin boss; f, represents a ring groove section; and g represents the inverted letter U. They went all the way through the skirt. I think they went all the way to the end of the skirt, but I am not positive. It has been a long time since I have seen that piston. It is a little detail that I wouldn't be sure about.

The part, h, represents the bottom part of the letter U, inverted. Part, i, represents the slot in the skirt, inside of the letter U. That went all the way through the skirt.

To prevent g and i from dropping out, there was webs on the inside, that supported the parts that were slotted. I could make a sketch to show those webs. (After making sketch, marked Fig. 3.) That is as well as I remember those webs.

In Fig. 3, part J represents the web in the inside of the piston. Part k, is a wrist-pin boss and l represents a ring groove section. I think there were two of the webs, j; one on either side. They were connected with

the piston by being fastened to the sides of the skirt. I don't remember whether they extended up into the head of the piston or not. They were cast on, and were also cast on to the wrist-pin bosses.

Mr. Bruninga: I offer in evidence "Defendants' Exhibit DD."

(Narrative continued) The piston as shown on Exhibit DD was shown to me by Mr. Elmer C. Long in 1913, as well as I remember. I was living in Barry at that time.

When I came to work for Mr. Long in February, 1918 Charles Chadwick was not working there. I think he came late in the Fall of that same year. I think it was before the first of the next year, 1919, but I wouldn't be positive.

My first work I did for Long, for probably four or five months, was just to take care of the sales room and cars—doing little light servicing of any cars that might come in. We had no regular shop at that time. After he moved over to the Eleventh and Main place, I took care of all the servicing on cars. Sometimes, when I was not busy on service work, I helped back in the machine shop. I did very little machine shop work.

I saw some pistons at Long's place, after we moved to Eleventh and Main; they were the slotted type, aluminum pistons. I don't remember seeing any pistons until he moved to Eleventh and Main, where he had his shop. That was right after he moved. He moved them from Quincy. It seems he was making these pistons in Hannibal, and when he left there he brought pistons from the shop in Hannibal to Quincy.

Mr. Richey: I object to testimony about what he seemed to do in Hannibal, as hearsay.

Mr. Bruninga: Q. 88. Do you know anything about what he was doing in Hannibal at that time?

(Narrative continued) He was working on the pistons. I remember when I was there—during the years that I was in Barry, when I would be over there, at one time he showed me an aluminum piston that he was working on. I never went to Hannibal after I started to work for Mr. Long in Quincy, to see what he was doing there. I don't remember of being down there until he started to move. I went down there and helped him move from Hannibal. It was probably four or five months after I

came to work for Mr. Long in February, 1918, that I helped him move from Hannibal to Quincy. That was when he bought this shop at Eleventh and Main, that he moved his shop from Hannibal to this place at Eleventh and Main. We moved some pistons from Hannibal to Quincy at that time.

I saw the pistons, and remember in particular that there was one aluminum slotted type piston. It was not like Exhibit DD; it was slotted different from that. The slots ran from the bottom of the skirt up to the lower ring groove, almost to the lower ring groove. The head of the piston had a slot on each side from the wrist-pin boss, from one wrist-pin boss around to the other. These slots in the skirt ran from the bottom of the skirt up to this slot that went around the head of the piston. I don't remember the number of slots, the number of perpendicular slots. I can make a sketch of what I saw. (Witness makes sketch, which is marked "Defendants' Exhibit EE," with a figure designated as Fig. 1.)

Q. 100. Mr. Bruninga: Under Fig. 2 I wish you would sketch a cross-section of that piston at right angles to the wrist-pin bosses.

(Witness makes sketch as requested.)

(Narrative continued) In Fig. 1, the part 1 represents the slot that runs from the bottom of the skirt up to the slot at the head of the skirt. Part, 2, is the wall of the skirt. Part 3, is the slot in the center of the skirt, and part, 4, is the slot that separates the head from the skirt.

The slots 1, 3 and 4 went through the skirt wall. Part, 5, represents a wrist-pin boss, and part 6, is the part of the wall of the piston in which the wrist-pin bosses is located. The line, 7, in Fig. 1; the wall of the piston on the side where the wrist-pin boss was cut away and that line, 7, is the lower part of that relief. That was cut away to keep the piston from sticking when the head came on it.

Lines, 8, represent ring grooves. Part 9, in Fig. 2 represents the web inside of the piston, to support the parts of the skirt that were cut away. Part 10, represents a wrist-pin boss. Part 11, is the lower part of the ring groove section, and parts 12, represents the slots on either side of the wrist-pin boss.

There were two webs, 9, on each side of the piston, extending across the wrist-pin boss—to the skirt, in

either side; right across the wrist-pin boss, and extended to the skirt on either side, and there was two of these webs, one on each side of the piston. They were cast altogether. When the piston was cast this web was part of the original casting. It was cast on to the skirt and on to the wrist-pin boss.

I saw such a piston like Exhibit EE, when I moved from Long's place in Hannibal to Long's place in Quincy —an aluminum piston. The first piston I saw I don't think had been used; it didn't have that appearance.

Mr. Bruninga: I offer in evidence "Defendants' Exhibit EE."

(Narrative continued) When I saw the piston like Exhibit DD, which I said was in 1913, Ed Cotter was there at the time. He was also there when I saw Exhibit EE. He was a machinist.

I don't remember how many pistons like EE were moved from Hannibal to Quincy, but there was more than one. Long's place in Hannibal was near Tenth and Broadway. After Long moved to Eleventh and Main in Quincy, he started to make pistons. I remember he made some of this type here, which I have just made a sketch of; Exhibit EE. Then, later, he made some that were a little different in regard to slots. One, in particular, that I remember, the head was cut away entirely from the skirt and there was a web run from the head of the piston inside down across the wrist-pin bosses, and extended to the skirt on either side, to support the part that was cut away.

(Witness is asked to make a cross-section at right angles to Fig. 2 of Exhibit EE, on the sheet handed him, which will be marked for identification, "Defendants' Exhibit FF." Fig. 3. After making sketch.) It was something like that. It might not look exactly like it.

In Fig. 3, parts 13, represent slots on either side of the wrist-pin boss. Part 1 is the slot at the top of the skirt that separates the head of the piston from the skirt —that went all the way around the piston. Slots, 13 and 14, went all the way through the skirt. Parts, 15, represent the ring groove. Part 16, is a wrist-pin boss, and 17 is the web that extends from the head of the skirt inside down over the wrist-pin boss and to the walls of the skirt on either side. There was one web, 17, on either side. I don't remember whether there were more or not. Two webs in all.

Fig. 3 is the same general view as Fig. 2. It looks at the piston the same way. I can, under Fig. 4, show a view of that piston looking to the left, towards Fig. 3; a view of the outside of the piston. (Witness makes sketch.)

That view, Fig. 4, is really looking in the same direction as Fig. 3, down on it. Line 16 represents a wrist-pin boss and line 17 is the lower part of the relief around the wrist-pin boss. Lines 18 represent slots on either side of the wrist-pin boss, and 20 is the slot at the head of the skirt, that separates the head of the piston from the skirt.

The piston shown in Figs. 3 and 4, Exhibit FF, was being made at Long's place after he moved his stuff from Hannibal to Quincy. That piston had six vertical slots. Only two are shown in Fig. 4; there were two on the other side and then one on each side, in the center of the skirt. That would come about where the edge of the skirt shows at the line 21, and there was one on the other side in the same position, at the line 22. That piston was being made some time during the early Fall—I don't remember the month—of 1918.

As well as I remember, it was before Charles Chadwick came. That was an aluminum piston. Some of those went into service on the Franklin cars. I put some of the type piston shown in Exhibit FF, in Franklin cars. I don't remember whether that was before or after Charles Chadwick came.

The first pistons I saw of those, were sand cast. I had a set of them in my shop; I junked them a few months ago, of that particular type of piston, that were sand cast. I sold them to a junk man. They were taken out of a Franklin car, series 9, with six pistons. The pistons were in good condition. They showed that they had been used. They were not broken in any way. I don't remember what car they came out of, now. I probably junked it. I junked a number of those old model Franklins in the last few years. I couldn't say how they got in that car.

This Defendants' Exhibit F is the same type of piston that we used there in Quincy. I think this is sand cast. I wouldn't be positive; I don't know enough about those castings to say.

(Mr. Bruninga offers in evidence "Defendants' Exhibit FF.")

The purpose of the depressed part opposite the wrist-pin bearings, in Exhibit F, is to allow more room for expansion when the heat comes on the piston, so the piston won't bind against the cylinder walls.

Exhibit F is the same type as the piston I saw in Hannibal before Mr. Long moved to Quincy, but I wouldn't be sure whether it is the identical type or not. Its construction is very much like it. Comparing Exhibit F with the piston that Long was making in Quincy, after he moved from Hannibal, as well as I remember, it is the same type of piston as he made there in Quincy. As far as the outside construction is concerned, I think Long made identically that type, in Quincy; but I wouldn't be positive about the webs inside. Those webs extending from the head down to the wrist-pin boss there, that I don't remember about. It has been a long time since I have seen any of that type piston.

The cross-webs in Exhibit F are the same as those Mr. Long used, I know. Those are the same as he used there in different types of pistons. The number of slots are the same; the relief on the wrist-pin boss is the same; also the slot extending all the way around.

Defendants' Exhibit R is the same type of piston as Exhibit F. Exhibit F is for a Franklin car. Exhibit R looks like an Oldsmobile size. I wouldn't be positive.

Long made pistons for a lot of different cars—Packard, Oldsmobile, Ford, Franklin, Studebaker—while he was still in Quincy. He made a number of different pistons for different cars. Before he moved away from Quincy. And they were of the type of Exhibits F and R, as far as the slots and webs were concerned. Some of them were shipped out, before Long left Quincy. I don't remember the names of any particular ones we shipped to, before Long left Quincy. We shipped pistons to the Franklin dealer at Peoria, Illinois; we shipped pistons to South Bend, Indiana; to St. Louis, Missouri, and some place in Michigan, but I don't remember the name now; those were aluminum pistons.

They were made in Mr. Long's shop there in Quincy, that is, they were machined there. The castings, most of them he got from Mr. Levett, I think, some place in New York. I believe he got some castings from Gilbert in St. Louis.

Mr. Richey: I object to the answer as just a speculation.

(Narrative continued) We did conduct some tests on pistons of the character of "Defendants' Exhibits F and R"—no, we didn't run any test on the smaller pistons; just the Franklin size was all we made any tests on—like Exhibit F.

The first test that I made was in 1918. We made tests before and we made tests after Mr. Chadwick came. I don't remember any particular test before Chadwick came.

There were different clearances used in those tests. Sometimes they would put them in with just clearance enough to be able to place them in the cylinder. I remember installing one set of pistons in Mr. Charles Bartlett's car, that had a clearance of one and one-half thousandths for the complete set. I brought that order in myself, after the pistons were installed, and it gave perfect satisfaction.

Mr. Richey: I object to the last statement as a conclusion.

(Narrative continued) I don't remember whether I examined the pistons after the test. There was no signs of sticking or laboring, or anything, while being used. I personally drove the car for ten days or two weeks, I think it was, after the pistons were installed. I did not find any binding. I can tell from experience whether a piston is working satisfactorily, while I am driving a car, and those pistons sure did work to my satisfaction.

That "Defendants' Exhibit V" is a book of inventory of the stock that Mr. Long had the time he sold out to Mr. Weems, and it is in my handwriting. I helped to take the inventory.

The notation "Inventory of E. C. Long, October 27, 1919 Machinery and Stock" is in my handwriting. Pages 28 and 29 are in my handwriting. I don't remember now if I took the inventory of the pistons noted on pages 28 and 29, but it is my handwriting. I don't remember the particular pistons noted on pages 28 and 29, or what construction they were. I wouldn't say whether or not any pistons like Exhibits F and R were in stock at that time. Those were the type that we were making, principally, all during the time that he was there, but I don't remember whether that is the type piston we inventoried or not. Long was making that type piston before that inventory was made.

(Defense Counsel offers in evidence "Defendants' Exhibit V.")

It was right after that inventory was taken, that Mr. Weems took over the business. I don't know exactly. I think the deal had been made before the inventory was made. It couldn't have been over a month, I don't think. I continued to work for Mr. Weems, and he continued to make the same type of piston—like Exhibits F and R.

I recognize "Defendants' Exhibit E" as one of the latest types that Mr. Long made. It is the type that the Franklin Automobile Company adopted. Weems made some of those pistons while I was with him—he made a lot of them, while I was with him. After he took over the business he started production just as soon as he could get organized and get his help together; within three weeks after he took over the business.

I don't remember what the production was, but I know they were being shipped out and were being put into cars, within a few weeks after Weems took over the business.

I don't remember whether Weems advertised those pistons, as far as local advertising is concerned. He sent out circulars to Franklin dealers over the country. I don't know how soon that was after he took over the business, but it was the same year that he bought Mr. Long out, and he shipped to Franklin dealers during that same year.

I didn't use many pistons like Exhibit F, after I came to Jacksonville. I never have used anything else only the Long type piston until this year, principally the Exhibit E. I bought some of them from Mr. Long, in Detroit, and bought the balance from Mr. Chadwick and Mr. Weems at Quincy. I found them satisfactory, but quit using them because Mr. Chadwick was not able to furnish them any more, neither was Mr. Long, and rather than send to the Franklin factory and wait for the shipment, I used some other type of piston. I used a Bohnalite, the type that is now being used in the Franklin automobile. I specified the Franklin car when I ordered the pistons, and that is what they sent me. That is a strut type piston. I haven't experienced any trouble with them, so far, but I don't believe I like them as well as the Long. I don't believe I can fit them as close as I can the Long piston. There is more tendency to slap, than the Long piston. The only place I know of now where you can get the Long piston, is from the Franklin factory, and I don't know whether I can get them there.

The first split skirt aluminum piston that I ever saw was the piston in Mr. Long's office in Hannibal, similar

to Exhibit F. I don't remember of seeing any other split pistons up to the time I came to Jacksonville, in 1923.

I never knew Edward J. Gulick, and he never offered to sell me a split piston. I heard of him in Mr. Long's, in 1926, when I was in Detroit. I never heard of him any other way that I remember now.

No one, except Chadwick, Weems, Long or the Franklin Company, offered me any split pistons, during the first year that I was in Jacksonville, 1923. Neither the Aluminum Company of America, nor the Cleveland Trust Company, ever offered me any. The only place I got them was from Long and Weems and Chadwick.

Weems was making these pistons like Exhibits F, E and R, during the first part of the year 1920. He made a good many of those Exhibit E, and they were being shipped out.

Miss Anna Landon was the head bookkeeper at Weems, when I was there.

I had not seen these particular pistons E, F and R, these particular ones, before this session—not that I know of. You did not show them to me, no.

Mr. Bruninga: Direct Examination closed.

Cross Examination by Mr. Richey.

I didn't, myself, ship out any of these pistons from the Weems Company. I didn't have anything to do with the shipping. All I know about it is that somebody else told me that they were shipped out. I wouldn't attempt to say how many I saw shipped out. They had—I don't know how many it was. There was times there when I helped inspect the pistons and I know they had big stacks of them. How many pistons, I wouldn't attempt to say. By "big stacks" and "a good many," I mean probably a hundred pistons or more, at a time.

I didn't make any of these pistons myself, while I was with Weems. I don't know how many I saw made. I know they were shipping out a lot of pistons. I saw the boxes nailed up and go out. My service room was right beside the packing room. In some cases I saw them putting the pistons in the boxes.

I know that since around 1920, split skirt pistons have been standard equipment in a few automobiles. I don't know how many different cars. I know they are in the Franklin. I don't know what other cars they are standard equipment in, because my service work from 1918, up until the last year or two, was just on Franklin,

alone. I wouldn't be in a position to know who else made and sold aluminum pistons, then the people I have testified about, nor what cars used them.

I did see different types of aluminum pistons after that, until the last four or five years—like these pistons on the desk here. All the pistons that I remember seeing prior to the last four or five years had possibly one slot in the skirt. I don't remember what car that piston was in, nor do I remember when I saw it. I saw it at an automobile show in St. Louis, probably four or five years ago; I saw some pistons that were slotted with slots on only one side. I don't remember about the slots under the ring lands. My memory is not good enough to tell whether there were any more than the one slot in it, what car it was in, and when it was that I saw it. I know it was four or five years ago.

I don't know whether the Bohnalite piston, like I bought recently for the Franklin car, has become standard equipment. I have seen Franklin cars lately, but I have had no occasion to examine into the pistons. I ordered those Bohnalite pistons through the local wholesale house from Central Automobile Equipment Company. I ordered pistons for a Franklin, Series 11. The order did not go to the Franklin Company; it went to the Company making this Bohnalite piston.

I said circulars were sent out from Quincy, but I didn't send out any. My work was in the shop, and they were sent out in the office. I know the circulars were there; I saw them. I saw the lists of names that they had, and saw them addressing envelopes. I am not positive as to who they sent them, or how many they sent out, but I know this, that they did send out some. I saw them folding them up and putting them in envelopes.

I was at Mr. Long's place in Detroit the first time I heard about Mr. Gulick. That was during the time I testified in these interference cases. Perhaps I talked to Mr. Long and Mr. Fletcher, the attorney, about the pistons I have testified to here; I don't remember now. I don't remember of any one else. That was in 1926, and I don't remember of going over any pistons until I came to testify. I don't remember whether I talked to Mr. Long or Mr. Fletcher about those pistons before I testified. That was six years ago.

Mr. Richey: It is agreed that Mr. Sidney D. Royalty testified in the Hartog-Long-Gulick Interferences Nos. 49569, 49570, 49571 in 1926.

(Narrative continued) I don't remember now what I testified at that time. I don't remember testifying that since my first employment with Mr. Long I had seen three or four different kinds of slotted pistons of Mr. Long's. I did testify that since my first employment with Mr. Long I had seen three or four different kinds of slotted pistons of his. I also testified that during 1918 and 1919 three or four different types were brought to my attention. That is to say, during the years 1918 and 1919 and including the form shown in Exhibit 1, there were altogether perhaps four or five different kinds of piston shown me by Mr. Long. I so testified in that case. I also testified that I made a number of tests on different sets of pistons, in that case. I also testified that I was not able to give any definite dates as to "when we tried any certain piston."

Mr. Richey: And when asked what were some of the changes made in these pistons, from test to test, you answered that that would be pretty hard to tell: That is correct, is it not? The entire question and answer were as follows:

"XQ. 61. What were some of the changes made in these pistons from test to test? A. That would be pretty hard to tell, just the different changes—I remember a few of them. In regard to the oil holes drilled in the wrist-pin boss, at first he used a very small drill to drill these holes, afterwards he used a larger drill. On Exhibit 1 at first we tested the piston without having any holes drilled below the ring groove on the wrist-pin boss sides, later we tried the same pistons with small holes drilled through the skirt. We also tried these pistons with skirts with different thicknesses. The ribs and also the webbing on the inside of the piston were changes slightly from time to time—that's about as well as I remember."

(Narrative continued) That is correct, and is my present recollection. I also testified that the other changes I did not remember, and that I didn't remember the order of these various tests; that I might test one type one week and then in a week or two come back with the same type with possibly a change or two made in it. That is my present recollection of it.

In this sketch I made, Exhibit DD, these webs ran straight across the piston, as well as I remember. In Fig. 2, the ends of the struts engage the inside of the

skirt on either side of the ring—wrist-pin boss, they extended right across the boss to the skirt, on either side. As to the part of the skirt they engaged, in Fig. 2, this diagram is not regular here. This is supposed to come across and engage this part here (indicating on diagram); between the vertical slots. Then they went straight over and engaged the other side of the skirt. This slot a, as near as I remember, was about in the center of the piston. This web here came in something like here (indicating on sketch).

Mr. Bruninga: Let him mark it in dotted lines, Mr. Richey.

(Witness marks on sketch. Narrative continued.)

In each case, the ends of the webs were near the vertical slots. I don't know just how to go about making a bottom view of the piston, looking down on it, on Exhibit DD.

XQ. 66. Just like you were looking into it, like that; looking right into the bottom of it; like you were looking down in a bucket. A. It is one thing to look down in a bucket, and another thing to make a diagram of it.

XQ. 67. In other words, you are having difficulty in making the diagram? A. Yes, sir.

XQ. 68. Although that is simpler than the other three diagrams you have made. You don't remember how it looked, looking down into the bottom of it? A. Yes, I know how it looked.

XQ. 69. Can you or can you not make it?

Mr. Bruninga: The witness can take his time, if it takes an hour to do it.

Mr. Richey: I have no objection to his taking time, but he is not making any progress; just sitting and looking at the paper.

(Witness makes sketch, which Mr. Richey marks Fig. 4.)

XQ. 70. You don't show the webs in the same way you did in Fig. 3, do you? A. I aimed to.

XQ. 71. That is not looking right down on the piston, into the bottom of it, is it, like I asked for? Can you make a view of the piston looking right into the bottom of it?

(Witness makes sketch.)

XQ. 72. Where was the slot, A? Put a lead line there and mark it "a." A. There is the slot, "a" (indicating on sketch).

XQ. 73. Would it be right there, you say? A. Yes, sir.

XQ. 74. Now, where would the slot, i, be? A. Over on this side.

XQ. 75. Where would the slots, g, be? A. That is wrong.

XQ. 76. You have them wrong; you want to put them here (indicating)? A. Yes.

XQ. 77. They would be outside, wouldn't they? A. Yes, sir.

XQ. 78. First you put them on the inside of the struts and then you put them on the outside; that is correct, isn't it? A. Yes; I didn't notice where the struts came there until I—I am not used to making diagrams.

XQ. 79. Now you have your slots a good deal wider apart in the last figure which you made, which I will mark "Fig. 5," than you have in Fig. 2, have you not? That is correct, isn't it? A. Yes; the diagrams are not proportioned right. This boss should extend in here further.

XQ. 80. In Fig. 5, that should extend in further? A. Yes, sir.

XQ. 81. And that would bring the struts in closer together? A. Yes, sir.

(Narrative continued) That would bring the slots, g, in closer, and the ends of the struts on the slot, a, side of the piston, shown in Fig. 1, would be close to slot, a; they would be closer than shown in the last diagram. They would have to be close enough together to clear the slots, g—to be inside of the slots, g. If they were in that close, over close to the slot, a, they wouldn't be close enough to prevent those wings from flexing back and forth. I don't remember now how close they were, after nineteen years. I just know they were there and that is all. I am not used to making diagrams. The sketch DD shows my recollection of what I saw nineteen years ago. This view (indicating) comes nearest showing what I saw; Figs. 1 and 2; as far as the inside is concerned, I don't remember a lot about it, but I know the general principle of the inside.

XQ. 90. You don't remember the inside, but you are just deducing that from what you remember about the

outside? A. I know just about what the construction was inside, but I am not as familiar—

XQ. 91. You say you know it, but I am asking what you remember. A. Yes, sir.

XQ. 92. Is it not a fact that you don't remember what the inside was, and you are deducing what that should have been from what you do remember about the outside?

Mr. Bruninga: Does the witness know what the word "deducing" means?

The Witness: I think so.

(Last previous question read to the witness.)

A. It is a fact that the inside is not as familiar to my memory as the outside.

Mr. Richey:

XQ. 93. It is pretty hard to remember these details for over nineteen years, isn't it? A. Yes, it is.

XQ. 94. You testified in those interferences, in 1926, as follows:

"Q. What do you mean by the sides of the skirt? A. The web extended right across the wrist-pin bosses on either side, and straight across, as I remember, extended over to the side of the skirt of the piston. I haven't seen one of those pistons since Mr. Long left Quincy. It's pretty hard for any one to remember the exact detail of the construction."

You so testified, did you not? A. Yes, sir.

XQ. 95. At that time, in 1926, you were testifying about a piston that you said you saw in 1918; that is correct, isn't it? A. Yes, sir.

XQ. 96. And when you gave that testimony you had reference to eight years and now you are talking about nineteen years; that is correct, isn't it? A. Yes, sir.

(Narrative continued) I don't remember only one or two pistons that I saw back there in 1913, like Exhibit DD. Mr. Long was working on a motor and that is the cast iron piston with the T-slot and U-slot in it, were the type he was using in that motor. I didn't see them in use in a motor and I don't know whether he used them in a motor or not, of my own knowledge.

I don't remember whether I saw one or two of them; I remember one distinctly. I don't remember whether that was the only one I saw; I would not be positive that

I didn't see more than one. I don't know whether he patented this one I said I saw in 1913, or not. I don't know whether he patented any of them; I was not interested in that part of it. I also took his word for it that he designed them.

Mr. Long was in Detroit, Michigan, the last I knew of him. That was probably three or four months ago.

I junked a bunch of old Franklin pistons a few months ago; took them out of a car and junked them; but I don't remember whose car it was, nor where I got it. I just found those pistons in my shop; I don't know how long they had been there. They weren't in a car when I found them; they had been taken out of a car which I had junked—a number of these old type Franklins, in the last four or five years. I would not attempt to say where they came from. They had been there since I had started to work in the shop. What I meant to say was, that they had been taken out of a car after I started to work in the shop. I took them out of the car, myself, but I don't remember whose car it was, or where it came from. As I said before, I junked a number of these old Franklins. I don't remember what particular car these came out of, but the pistons that I had taken out, which is quite a number in the last nine years, had been thrown aside there, and when I began to gather them up I found one set of these old pistons.

In giving my employment I did forget to mention that at one time I worked for the Wells Fargo Express Company at Kansas City; I was there a few weeks.

Mr. Richey: That is all.

RE-DIRECT EXAMINATION by Mr. Bruninga.

I am not a draftsman, and never took a course in drafting.

Mr. Bruninga: Deposition closed.

Mr. Bruninga: Now, I have a deposition of Mr. Stellman here, taken in St. Louis. It is a fact deposition, going to this same matter. Mr. Stellman is here, but as I understand Mr. Richey is perfectly agreeable to let me read that deposition of Mr. Stellman because he is going to be examined as an expert on the patent situation generally, after the deposition. I have no objection if the other side wants to cross examine on this fact testimony.

The Master: You mean use the direct, not the cross?

Mr. Bruninga: We will read his entire deposition to the Court. If necessary Mr. Stellman could come in and read it himself, in order to save time.

Mr. Watts: As I understand it from Mr. Richey, we haven't any objection to raise on the ground the witness is here, therefore his deposition should not be used, so we are perfectly willing to go ahead with the deposition part if we may have the right to further cross examination.

The Master: Very well.

(Thereupon, adjournment was taken to 9:30 A. M. of the following Monday morning.)

(At 9:30 A. M., Monday, January 30, 1933, the hearing was resumed. Present: Messrs. Richey & McCoy for plaintiffs; and Messrs. Bruninga and Sutherland for defendants.)

(Reading of deposition of Mr. Louis M. Stellman continued from page 454 to page 466.)

Louis M. Stellman, a witness produced in behalf of Defendants, being duly sworn, testified as follows:

Direct Examination by Mr. Bruninga.

My name is Louis M. Stellman; age 46; and I reside at Syracuse, New York. I am a consulting engineer, specializing in gasoline motors and automotive products. I studied mechanical engineering at the University of Michigan. I entered the employ of the H. H. Franklin Manufacturing Company, of Syracuse, July 1, 1909, as a student engineer, working in the mechanical laboratory. That company at that time was manufacturing automobiles with air-cooled engines. I severed my connections with the Franklin Company in June, 1924.

I worked through various departments of the Franklin Company between July 1, 1909 and June, 1924, in an engineering capacity. I finally became Chief Engineer in May, 1920, I think it was, and was Chief Engineer when I left there. I was Assistant Chief Engineer before that.

The Franklin Company was manufacturing and marketing the model designated as Series 9-A during the years 1915 and 1916. As I remember, we started that

model with a cast iron piston in the year 1915, and then changed to an aluminum piston in 1916. The first aluminum piston was a trunk type piston, with a slotted lower end, although, I think, the first aluminum pistons we used were a plain trunk type piston. Afterwards we slotted the lower ends. That slotted piston, essentially, was a trunk type piston with slots running vertically in the piston skirt up to about the center line of the wrist-pin boss. Those slots were four in number, I think, and ran from the bottom toward the top of the piston, and were located on each side of the skirt. By "side of the skirt" I mean the side opposite the plane through the wrist pin boss. The piston marked "Defendants' Exhibit B" is the type of piston I have been trying to describe. It is the aluminum piston which Franklin used after this four side slot experience. I should judge that Exhibit B is a Franklin piston. (After measuring Exhibit B.) It is the same bore, the same diameter, as the Franklin piston, and is a Franklin piston of that period. Franklin started to use that type of piston in 1916, in production, and used it until October 27, 1920, I think. It was put out as part of the new car, in regular standard Franklin production. Prior to that time that particular type piston was not used for anything else.

The slots of that Exhibit B piston allowed the piston to be used with less trouble from piston slap and noises in the engine; piston noises in the engine.

Franklin used a piston of that particular construction, with four slots in it, later than 1916, and it was always used in production in just that form. In service we later incorporated a split ring in the bottom of this piston to expand the piston—help to expand the piston against the cylinder walls. At the Franklin factory the Service department that supplied the dealers with parts, was a separate organization from the organization that built new cars. The Service department supplied this split ring in pistons, and separate from the pistons, for dealers to install in pistons they already had. This ring fitted into a groove which was turned inside of the bottom of the skirt, this groove holding the ring in the piston. This ring was a split ring, a good deal like a piston ring except it was made of steel, and was put in under different pressure.

There was a Franklin car, known as a Series 9-A, put on the market along in 1915. It was shown in New York in January, 1916, and in the Chicago show of that

same year, I think, the last of January, 1916. I attended that Chicago show.

I first met Elmer C. Long when he came to the Franklin factory in March, 1916, after the Chicago show. I heard of Mr. Long through one of our dealers who came to the factory after the show, Mr. Frank Sanders. At that meeting with Mr. Long in 1916 he showed me a piston of his design. It was essentially a trunk piston that differed from an ordinary trunk piston in that it had the skirt supported by two webs, which were in turn supported by the wrist-pin boss, and the piston skirt was divided, or separated, from the head of the piston by a circumferential groove, and it was also divided into pads by six slots running vertically from the bottom of the piston to the circumferential groove. This divided the piston skirt into four of these pads, each one of the pads being supported by this web, or by a web, which ran from the boss to the interior of the pad. Those pads were located on the sides of the piston parallel to the plane running through the center of the wrist pin boss. That top groove was located just below the lowest ring land, and it went all the way around the skirt. The Franklin Company adopted a piston of the type I have just described, in standard production on October 27, 1920. It was adopted in service in April, 1920. By that I mean that the Service department offered it to its dealers as a replacement proposition for pistons already in service at that time. Those pistons that the Service department furnished to dealers were sand cast aluminum alloy pistons. The first outstanding test of that piston by the Franklin Company before the adoption of it by the Service department, that I remember, was one that we made with Mr. Long, I made with Mr. Long, in which we put the pistons in a car, in an engine, and drove the car to New York, from New York up into New England, and back to Syracuse. That test was made in March, 1919. About that time, or a little after, the Franklin Company entered into an arrangement with Mr. Long.

Defendants' Exhibit F is what we call a Long type piston, suitable for use in a Franklin motor, and is a sand cast piston, I should say. That piston is similar in construction to the one that Mr. Long showed me in March, 1916. It might have been some different in the internal ribbing, but essentially that is the design. The internal ribbing that I have in mind would not affect the operation of the piston.

The photostat marked "Defendants' Exhibit Y" represents an ordinary trunk piston, I should think.

(Witness makes certain markings on Exhibit Y.)

"a" in Figs. 5 and 6 represents the top of the web. The groove is the same line running circumferentially around the piston, shown by this same line "a." It also designates the top of the groove. That groove ran all the way around the Long piston which he showed me in 1916, so that the skirt was separate from the head. The skirt was supported on the head by the webs "b" which were fastened to the wrist pin boss. The parts designated "c" are vertical slots in the skirt of the piston which went from the bottom to the circumferential groove just below the ring lands.

3 and 4 represent just the ordinary trunk piston. "d" represents a rib between the head and the wrist-pin boss. Fig. 1 is taking a side view of the piston and Fig. 5 is taking a section through the center line of the wrist-pin, to vertical section. The slots "c" and the webs "b" in these figures are reversed, which is a mistake in drawing of the No. 1 view. In Fig. 1 the slots should be shown as outside of the web. Fig. 5 is correct. Figs. 5 and 6 essentially represent the piston that was shown to me by Mr. Long in 1916. I carefully examined that piston at that time, because I was interested in a piston design, or any improved design for the Franklin car.

The construction, Exhibit B, was in use in March, 1916, but not in an entirely satisfactory use. I considered Exhibit B better than the ordinary unslotted trunk piston. As I remember it, that piston was supposed to run three thousandths at the bottom and nine at the top, that is, the top of the skirt. The clearances above the skirt are greater than that, between the ring land—the clearance between the ring lands was greater than nine thousandths. I do not know what became of the piston that Mr. Long showed me in March 1916.

Mr. William M. Venner was in the employ of the Franklin Company in 1916. He had been previously employed by the Franklin Company, I should say, for a number of years.

The Long pistons that were used in the test in March, 1919 were similar to Exhibit F. There were six pistons used in that test. On that particular test, I think we put them in at two thousandths clearance between the cylinder and piston on diameter, they being straight pistons—

two thousandths clearance all the way up the skirt through the circumferential groove. Those pistons were aluminum alloy, and were furnished direct to me by Mr. Long. The distance covered in that test was about nine hundred miles. In New England we encountered spring weather, but some snow and considerable mud. In New England we didn't have much concrete road. We went up there purposely to try the car out through heavy going and hard mud roads. I remember that on the way back we came up over the Mohawk Trail, which is rather a tough mountain grade, and we had, as I remember, several inches of snow on the ground. I personally made a report of that test, to the management of the company, which was an inter-departmental report. The two sheets of paper dated March 18, 1919, which you have just handed me, entitled, "Test on Long pistons" is the report of the test to which I have just referred. It has Mr. Murphy's initials, who was then Chief Engineer of the Company, up in the upper right-hand corner of the first page. The initials in the upper right-hand corner are in Mr. Murphy's handwriting. I dictated the report, soon after the trip, probably within a day or two after the trip. I have not recently entirely read that report.

(Witness reads report.)

That report refreshes my recollection as to what time the test was made.

Aluminum pistons, furnished by Mr. Long, similar to those shown in Exhibit F, were used in that test. I don't remember as that report describes the pistons in definite detail, but my recollection is that the internal ribbing was somewhat different from those in Exhibit F; that is, not so that it affected the performance of the piston in the motor. I think the slotting was the same; the webs that support the pads were the same; it had the same number of pads, and it had the same circumferential groove.

I examined those pistons after the test run, and I considered them very good. They showed no practical—they were in every way satisfactory.

I can positively identify this report of March 18, 1919, which is marked "Defendant Exhibit Z," as one made by me at that time.

Mr. Bruninga: I offer this report in evidence as "Defendants' Exhibit Z." I want to substitute a photostat.

Mr. Richey: I have no objection to your substituting a photostatic copy of it for the original, on the same condition, that we may be permitted to see the original, and make any corrections that may occur.

(Narrative continued) The Franklin Company entered into a contract with Mr. Long after that test run, so that he was protected in connection with certain considerations, if and when the Franklin Company used a piston of that kind.

Mr. John Wilkinson was Vice-President of the H. H. Franklin Manufacturing Company, and I know his signature. The signature appearing on the Memorandum of Agreement dated March 20, 1919, between Elmer C. Long of Quincy, Illinois, and H. H. Franklin Manufacturing Company, and marked "Defendants' Exhibit AA," is Mr. Wilkinson's signature. I have not seen that particular agreement, but I have seen copies of it.

(After examining document) That is the agreement which I understood had been entered into between the Franklin Company and Mr. Long.

Mr. Bruninga: I offer in evidence "Defendants' Exhibit AA," and I should like to have counsel stipulate that I may substitute a photostat.

Mr. Richey: We agree that a photostat may be substituted for the original, subject to correction, if there are any errors, and with the understanding that we may see the original at any time we wish.

(Narrative continued) "Defendants' Exhibit 2" states "Several tests have been run in connection with this piston; the first being a set-up test on the block with baffle plates under the cylinders which did not give a sufficient amount of oil so but what a set-up was obtained in about nine minutes." I remember that particular test. The piston used in that test was very similar in construction to the one used in the test described. It was practically the same in construction as Exhibit F. That test was a difficult one; more difficult than would be employed in production—in a regular production piston at that time.

I can't remember definitely other tests of Exhibit Z. All I know, we were experimenting with the piston considerably between the time Mr. Long first showed it to us and the time of the test reported in Exhibit Z.

I remember Mr. Gillett, of Chicago. He was a banker, a personal friend of Mr. Franklin. We built a Franklin car for Mr. Gillett's use in which we incorporated a set of pistons similar in design to those used in the test, the test called Exhibit Z. These pistons were installed in a motor in this car, and the car was shipped to Mr. Gillett for his personal use. I don't know that he knew that it had special pistons in it, but we considered these pistons were better than the pistons in regular production run of cars, and, therefore, we put a set in Mr. Gillett's car, because we liked to give him the best of anything that the Franklin Company had. This happened about two months after the report, Exhibit Z, was made.

The blue-print marked P-3984 of H. H. Franklin Manufacturing Company, marked for identification "Defendants' Exhibit BB" was obtained by me personally from the files of the Franklin Company just last Monday. That print represents an aluminum piston designed after—or, the principles incorporated in the piston shown in Exhibit F. I have no personal recollection of the making of that drawing. I cannot tell who made it, by looking at this print, but I could from the original. I have no personal recollection of when this drawing was made. Within a few weeks, possibly a month after the test, there were some pistons made like those illustrated in that drawing, and those pistons were sand cast and were given a test. The pistons operated satisfactorily in that test.

I understand that Mr. Long received royalties from Franklin, in accordance with the agreement Exhibit AA. However, I never saw the checks.

I recognize "Defendants' Exhibit C" as a copy of a Service Department bulletin as furnished by the H. H. Franklin Company. I personally received such bulletins in 1920. Those bulletins were dated on the day they were written, usually; then they were printed and sent out within the next day or two. This last item on that bulletin states that on and "After April 15 the Service Department will be able to furnish Long Type Pistons in the standard size. These are straight pistons with two to three thousandths clearance. Their weight is approximately the same as the standard piston. While these pistons have not proved satisfactory in production, we find that they work out very well when used in slightly worn cylinders; cylinders that are not worn more than

.005 to .006 inch. If the cylinders are worn more than this they should be rebored. Long Type Pistons will be sold at the same price as the standard piston; viz, $8.50 list, complete with wrist pins, and rings, subject to the regular discount. Oversize, Long Type Pistons cannot be furnished."

Those Long Type Pistons were furnished by the Service Department on April 15, 1920, or soon after. No bulletins like that issued before the Franklin Company was ready to furnish pistons; that demonstrates to me that they had the pistons practically ready to ship to their dealers. I should say that the Franklin Company was ready to deliver pistons similar to type F, shown.

Q. 191. This bulletin, Exhibit C, bears the statement which you have previously quoted: "While these pistons have not proved satisfactory in production, we find that they work out very well when used in slightly worn cylinders"; have you anything to say about that?

Mr. Richey: I object to the question as too broad; it invites opinion, speculation, and hearsay.

Mr. Bruninga: I will ask this other question:

Q. 192. Can you say why those pistons had not proved satisfactory in production?

The Witness: We had trouble in getting the Long piston in production, because of the green condition of cylinders, as the pistons were started through the manufacturing test. These cylinders had a certain amount of roughness, inasmuch as it was a ground surface in the bore of the cylinder, and the grinding wheel would leave a fuzz, or, to a certain extent, rough surfaces on the cast iron. Those rough surfaces had a tendency to cause the piston to score in the cylinder, when it was first started up, and run in a production test. After April 15, 1920 they worked out in service very satisfactorily. The first pistons furnished by the Service Department were sand cast. Just before they put them in production, a satisfactory die casting was received. There was trouble in getting satisfactory die castings. It was difficult to make that type of piston in a die casting, and we had some trouble in getting dimensions just as we wanted them in a piston casting.

Cars were actually shipped by October 27, 1920, with Long pistons incorporated in them. By "Long pistons" I mean pistons designed "similar" to those shown in Exhibit F, but of the die cast type.

I recognize Exhibits E and G as die cast pistons that were used in the Franklin car.

I recognize "Defendants' Exhibit D" as a Service Department bulletin issued by the Franklin Automobile Company, similar ones of which were received by me at that time. This bulletin is dated November 11, 1920, and it specifically says that, "All Series 9 cars have been equipped with pistons made from this material and are giving satisfactory service."

I had nothing to do with the preparation of the bulletins, like Exhibits C and D, except that I may have furnished information in connection with them.

Die cast, Long type pistons, such as Exhibit E, were in production in Franklin cars on November 11, 1920. No sand cast pistons were used in what we considered regular production of Franklin cars, that is, in the Long type.

After doing experimental work on the particular design being tested, the Franklin Company oftentimes put through a certain number of specific designs through the regular production channels, to try them out as to their suitability for production work. Usually, this was done with some few cars before the product was put into regular standard production.

I think that twenty cars were put through with pistons similar to Exhibit E, before Exhibit D was issued; during the summer before that date.

Defendants' Exhibit H is another Service Department bulletin, dated April 18, 1922. It was issued probably within a day or two of the date that appears thereon.

Defendants' Exhibit I is another Service Department bulletin, issued under date of February 20, 1923, and was probably issued within a day or two of that date.

The Long type pistons, similar to Exhibit C, were being used in Franklin cars when I left in June, 1924. They were used in, I should say, twenty-five to thirty-five thousand cars, up to that time, six pistons for each car.

The oval piston referred to in Defendants' Exhibit H was a trunk type piston, ground so that the section through the skirt would be of slightly oval shape, the large diameter being perpendicular with the wrist-pin. They were used in regular production for a time—as my memory goes, about in 1922—for a few months, but were

discontinued because of the fact that they did not give entire satisfaction. I don't think any royalty had to be paid on those oval pistons.

I never met Edward J. Gulick, of Elkhart, Indiana. I never saw one of his pistons in production. None of his pistons, that I know of, were offered to the Franklin Automobile Company, while I was there.

I don't think any split pistons were offered to us by the Aluminum Company of America, while I was with Franklin, prior to November, 1920. I don't think they were particularly interested in split pistons, prior to 1920.

Mr. Richey: I object to the last sentence as being a conclusion of the witness, and incompetent.

No split pistons, to my knowledge, were offered to the Franklin Company or to me as chief engineer, prior to November, 1920, by the Cleveland Trust Company, of Cleveland, Ohio. I have an idea that split pistons, if that means some portion of the skirt being slotted, were offered to us prior to November, 1920. I can't designate any particular person or company. I don't actually know of any split pistons being offered to us before that date (November 1920). There was a need for such a piston by the Franklin Company prior to November, 1920.

I should say that an air-cooled motor, such as used in the Franklin car, was a difficult motor to equip with suitable aluminum pistons. I did not know of any car which was more difficult to equip with aluminum pistons prior to November, 1920.

A straight aluminum alloy trunk piston without any splits in it would not work in a Franklin car, because you had to give it too much initial clearance. I remember we gave the bottom of the skirt five thousandths and the top nine thousandths, between the cylinder and the piston. The clearance given to Exhibit B pistons was three thousandths at the bottom and nine at the top of the skirt.

We gave the Long pistons four to five thousandths clearance, as I remember, all the way up the skirt, when we put them into production in 1920. I would say, then, that there was a crying demand for an aluminum alloy piston that would work with a minimum of clearance, in the Franklin car, before November, 1920. The Long piston supplied that want of the Franklin Company, the best of any at the time.

I have had occasion to examine other pistons on the market, even to date, and in my opinion the Long piston is still the best piston on the market for operation in automobiles.

I advised that the Long pistons be put in the Gillett car. I would not have put anything in Mr. Gillett's car, as an experimental car, in the sense that we wanted to try out anything that was not already proven satisfactory.

The Franklin Company did not essentially change the construction of the Long type piston from that illustrated by Exhibit G, during the period from April, 1920, to June, 1924. All of those pistons had six vertical slots, with a horizontal groove at the top, below the ring lands, and with webs extending from the wrist-pin bosses and going to the four pads, as in Exhibit G. They were relieved opposite the wrist-pin bosses. Pistons of that general design were furnished by the Service Department before July, 1920, but before November 1920 they were sand cast. They were not exactly like Exhibit G.

Exhibit F is apparently one of the sand cast pistons that was furnished by the Service Department during that time.

Mr. Bruninga: Take the witness.

Cross Examination by Mr. Richey.

When I went with the Franklin Company they were using an ordinary iron trunk type piston, and I think we used the iron piston until in 1916. I can't tell you in detail what changes we made in the iron piston during that period, but we changed models several times; I know we changed the size of the piston. I presume we changed the construction of it. The trouble with the iron piston was that it was too heavy, and was too poor a conductor of heat; I would say that was the fundamental difficulty with cast iron.

Mr. Bruninga: This line of examination is objected to as not very material, and as having no foundation in the direct.

Mr. Richey: The witness was asked about iron pistons.

Mr. Bruninga: None of the patents in suit is for an aluminum piston per se, or even a die cast aluminum piston, although the Aluminum Company of America wants to call that a permanent mold piston.

Mr. Richey: The direct examination has not been concluded by the patents in suit, by any means.

(Narrative continued) It was known in 1909 and 1916 that aluminum was lighter and a better conductor of heat than iron, and, I presume, better material for pistons. I thought it was better material for pistons during that period. Another trouble with the iron piston was that, due to its poor conductivity of heat, it would run hotter and collect more carbon. The aluminum piston did not have that fault to as great a degree as the iron piston, probably because it was a better conductor of heat.

XQ. 14. And you know that from 1909 to 1916, did you not?

Mr. Bruninga: In order to avoid repetition, I should like to have it understood that my objection goes to this entire line of cross examination.

Mr. Richey: It is understood that the objection applies, without being repeated.

The Witness: I don't think, in 1909, the question of aluminum pistons had come up to any great extent, but some time during that time.

If we thought of the use of aluminum as a piston in a motor, we probably thought of the advantages of aluminum over iron. The faults of the iron piston, and the fact that the aluminum piston did not possess those faults, was generally known, I should think, in the automobile business in those years.

I think we gave the iron pistons two thousandths clearance, straight. That is the desirable clearance, approximately. The trouble with any greater clearance is that it pumps more oil and more gasoline, and it is noisy due to the slapping.

The Franklin Company were always working with pistons, to make a better iron piston, if they could, to overcome those disadvantages.

In the first part of 1916, I should say, the Franklin Company adopted a trunk type aluminum piston which was more or less a duplicate of the iron piston that they had been using previous to that,—it wasn't a duplicate but it resembled it. The clearance we gave this piston was five thousandths at the bottom of the skirt and nine thousandths at the top of the skirt—it tapered. Those pistons slapped more or less, and they pumped oil. There was not a serious objection to their pumping oil; probably

they did with some; all pistons do, some. The greater the clearance, the more they pump oil. We probably had some trouble with the pistons sticking in the cylinders and scoring, but the major trouble with them was noise, slap. We gave the aluminum pistons greater clearance, because aluminum expands faster under heat than iron, and we had to give that clearance to keep them from expanding up to the iron cylinder, and keep them from sticking or scoring. We used that trunk type aluminum piston until we went to the Long type piston.

We used the trunk type pistons without any splits in them for about a year to a year and a half, then we split them like Exhibit B, to allow equipping them with less clearance at the bottom of the skirt, to try to overcome slapping and noise. We improved the condition, but we still had some trouble with it. We used three thousandths clearance at the bottom of the skirt of that piston and nine at the top. We did not have so much trouble with those pistons sticking or scoring, but we had some; that is, not as much as with the trunk type. We modified that piston by putting an expansion ring in the bottom, but that was done principally in service, I should say, in 1917 or 1918. Then in 1920 we went to what we call the Long type of piston. That Long type piston had a clearance allowance of four to five thousandths all the way up the skirt. That piston did not slap or make a noise to any appreciable extent. I never saw an aluminum piston that didn't make some noise. That Long piston with four or five thousandths clearance did make a noise. Of course, if you ran it with two thousandths it would still further reduce it.

We tried out this oval piston in about 1922. I am not sure why we tried it out, but I think it was to get away from paying Mr. Long that royalty. This Long piston is, relatively speaking, an expensive piston to make. I heard that the Franklin Company did discontinue the Long piston along about 1928, or somewhere along there.

I do not know of any other automobile company that adopted this Long piston as standard equipment.

Other types of aluminum pistons were adopted by other automobile manufacturers.

The companies who supplied the castings to other automobile manufacturers, were The Aluminum Company, Walker Levett, and the Bohn Aluminum and Brass Company. I don't know whether or not the Kant Skore Company of Cincinnati supplied any for production. I

understood they did supply them for replacement. I have seen those pistons that were supplied, after they were machined up. I know in general what they were like.

In general design, the pistons that were furnished by the Aluminum Company, Bohn and Kant Skore, to manufacturers, were like that shown in the drawing of the Maynard patent 1,655,968, in this suit, but I don't know that they were slotted like that. I know that that piston shown in the drawing, and commonly known as a split skirt piston in the industry, was used in quantities since around 1921. That is the piston that was machined from many of the castings that were furnished by the companies I have named, to the automobile manufacturers and replacement people, sometime during that time, and still is, as far as I know.

I do not know of anybody using this Long type piston now.

With reference to Exhibit Z, "Hartog v. Long v. Gulick Int. 49,572" and "Hartog v. Long Int. 49,581, Long Exhibit No. 3," I testified in those interferences about that report, on behalf of Long, in January, 1926, I think it was. At that time, when my attention was called to the fact that some of these views on Exhibit Y did not check with each other, I made a side remark that did not get on the record, "I am afraid I am getting rusty." I said that in apology for getting these drawings in disagreement with each other. I am even more rusty now than I was in 1926, when I testified in the interferences, with respect to my drawings, but not with respect to my recollection about these things. I don't think my memory is any better than it was in 1926, but my recollection is better now.

Our piston troubles in 1916 were greater than they were in 1919.

I came here from Syracuse, New York, just to testify in this case. I hope to be paid on a *per diem* basis, but I have made no arrangements about being paid. I charged fifty dollars per day in the aforementioned interferences, and I expect at least that much for testifying here.

I attended the Automobile Show in Chicago in 1916. I also attended automobile shows of other years, but I don't remember just what years. I did not attend them while I was with the Franklin Company, however.

I have seen Mr. Venner since I came to St. Louis on this trip, but I did not talk to him about this case. I just talked to him a minute and said "Hello," and "How are you?" and passed the time of day.

Mr. Venner came to the Franklin factory more or less frequently while he was at South Bend. I saw him from time to time on those visits.

When Mr. Long showed me this piston in my office at the Franklin plant in Syracuse, in March, 1916 (probably about the middle of the month), there were probably others present besides Mr. Long and myself, but I don't remember definitely who. My office was in the engineering department on the second floor, about a block from the experimental laboratory which was on the ground floor. Mr. Long and I talked several different times about that piston while he was there, always in my office. I don't remember having any conversation about it at the door of the experimental laboratory, or anywhere outside of my office.

There was one rib in the top of that Long piston. I am certain that the slot was cut all the way around the top. If Mr. Chadwick, who went to work for Mr. Long in the latter part of 1918, testified that he and Mr. Long designed that slot all the way around in that piston, I would still say that this 1916 piston had a slot all the way around. The Exhibit Z report is not the only report that we had of a test of these Long pistons, but that is the most complete report as of that date. I know there were other reports at the Franklin Company in Syracuse, but this is the only one I have. Mr. Long furnished the copy of that report when I testified in the interferences in 1926.

The statement in Exhibit C, to the effect that at the date of that bulletin, April 8, 1920, the Long pistons had not proved satisfactory in production, is true. They worked better in slightly worn cylinders because of the fact that the grinding glaze had been removed in the cylinder, due to previous contact with other pistons. I don't think it was because it gave some clearance, but simply that the surface was smooth.

The statement in Exhibit D, "The distinct advantage as a material for pistons which an aluminum alloy, with its very light weight and great ability to throw off heat, has over cast iron, is conceded by all automobile engineers" was a true statement at that date, and I should say that statement would hold true for a great number of years before 1920. The following statement from bulletin, Exhibit D, is also true:

"The Franklin engineers, however, realizing the particularly desirable features of the aluminum alloy

piston, have for the past three years been conducting exhaustive experiments with a view of securing a design that the undesirable features would be eliminated." This statement was made as of November 11, 1920. I also understood the following statement in Exhibit Z to be true: "Mr. Long, our dealer in Quincy, Illinois, was out here with a new design of aluminum piston for our motor in connection with which he has had four claims allowed by the Patent Office." I suppose Mr. Long told me that these four claims had been allowed on this new design of piston. When Mr. Long came to Syracuse in March, 1919, he didn't have any of these pistons with him, that I know of. I don't remember whether he brought any in March, 1919, but we had pistons there that we had been experimenting with, of this design. I think Mr. Long did bring some pistons like Exhibits E, F and G with him when he came to the plant in March, 1919—I can't tell just how many, but I think several sets. I don't remember whether or not he sent back home to have some more sent down at that time.

It was our custom to make reports of our tests, like Exhibit Z, within a day or two after the tests. The set-up test on a block with baffle plates under the cylinders, referred to in the report, was made, I should say, a few days previous to the report.

One of the troubles we had on production cars, which is referred to in Exhibit Z, was due to pre-ignition. Pre-ignition is caused by some action in the cylinder that causes the charge to combust before the time that the spark would ordinarily ignite the charge. The trouble referred to there, I think, was in connection with some of the threads in the bottom spark-plug hole, below the point where the spark-plug came in this hole, becoming incandescent and causing it to ignite. I understand that that was sometimes caused by the top of the iron piston getting too hot. Aluminum pistons helped this condition.

Some time during the contract, I think, the royalties that Franklin paid Long on these pistons was ten cents a piston.

When Mr. Long showed me these pistons in March, 1919, he was there sometimes all over the plant, but principally in my office and in the experimental room and testing laboratory. Mr. Venner was there at the factory, I know, during the time of those conversations in 1919, but whether he was there when I was talking to

Mr. Long, I don't know. I presume I did have a conversation with Mr. Long about these pistons at the door of the experimental laboratory in March, 1919. I don't remember, but I presume Mr. Venner was present at one of those conversations; that would be natural, because we were testing them in the laboratory at that time. Those tests were made under my supervision. I don't remember the man's name, that actually made the tests.

My memory is better now than it was six years ago, when I testified for Mr. Long, because I have reviewed the facts in the case more recently than I did then. I talked with the men at the factory about them, Mr. Castor for one. He is not in the Franklin factory now, by the way. He is in Jordan, a town outside of Syracuse. I also talked with Mr. Chadwick, Mr. Davis, Mr. Burns, and one or two men in the sales department of Franklin. The Mr. Chadwick of whom I speak is Frank Chadwick, who has charge of the records at the factory. Any difference between my testimony now and that which I gave in 1926 would be due to what these people told me, and the records which I looked over.

I couldn't say that it is a fact that the first pistons of Long that were tested at the Franklin plant were tested on October 5, 1918. My examination of the records and the talk with Mr. Castor did not refresh my recollection on that point. I think we made a report, somewhere, to the effect that in the first test made in the laboratory there on Long pistons, two of the pistons froze after running ten minutes. If there was a report to that effect, that was the fact. By "froze" was meant they stuck in the cylinders.

I don't remember any tests made of the Long pistons prior to October 5, 1918. In my examination of the records of the Franklin plant since the last time I testified here I found some records of tests on Long pistons other than this Exhibit Z, but I don't remember the date of the first one. The majority of them were after this date of Exhibit Z, but I couldn't say whether or not all of them were. Those records are now in the Franklin plant. I didn't bring any of them with me because I was not asked to. I think I mentioned to Mr. Bruninga that I had examined those records before I came here. There is one record that has been submitted there, that I think is before that date, and that is that drawing (indicating Exhibit BB) dated May 8th, 1919.

The drawing marked "Gulick Exhibit D-793-X" in the interference record, here marked for identification as Plaintiffs' Exhibit 1Z, is a design similar to the piston furnished the Franklin Company; it is similar to piston Exhibit B in this case. This drawing bears the date of February 11, 1919. The Franklin Company, in February 1919, was still working upon pistons like Exhibit B, trying to improve the design of them.

(*At the trial*, during the reading of the deposition:

By Mr. Richey: Now about these blueprints D-793-X, D-944-X, and D-960-X, I want to offer the same blueprints that were in the interference records and have them substituted for the lithographs, Defendants' Exhibit CC. These were the original exhibits in the Gulick interference and are Exhibits CC'.)

I don't recognize the slot in the drawing marked "Gulick Exhibit D-944-X." It says that it is a proposed design for the Franklin Company, but I do not remember anything about it.

XQ. 215. I show you a drawing marked "Gulick Exhibit D-960-X" (included in Exhibit CC'). Do you remember that as a proposed design of Franklin pistons?

Mr. Bruninga: I make the same objection to this procedure.

A. Yes, sir. That drawing is dated May 30, 1919.

(Narrative continued) I don't remember the date when it was proposed for the Franklin engine, and the date on that drawing does not refresh my recollection.

The Aluminum Castings Company of Cleveland, Ohio, made some drawings of proposed designs for the Franklin Company. I do not recognize the name of the checker on drawing D-960-X.

I saw some of the pistons, Exhibits E, F and G, before I made this drawing, Exhibit Y. The one I saw was Exhibit F.

The maximum speed at which these pistons reciprocated in the engine cylinder, at that time, was about a thousand feet a minute. I should say that speed has been increased since then. I should say that the engines were redesigned on account of the adoption of the aluminum piston. The R. P. M. of the engines using alu-

minum pistons was 3200 or 3300, and that is the maximum speed today. The maximum R. P. M. around 1926 was 2400 to 2600, I should say. I would say that the maximum pressure per square inch on the tops of these pistons, when the explosion takes place, is 350 pounds per square inch. In 1920, I guess, it was around 275. The length of stroke in the Franklin engine in 1920 was four inches.

Mr. McCoy: That gives you an average travel of 1733 feet per minute. That would be much less than the maximum speed, I should judge, for 1920.

(Narrative continued) When I examined the records there at the Franklin plant since 1926, I did not find any definite records that I could offer as evidence, other than of the Long pistons like E, F and G. Long did submit to the Franklin Company other designs of pistons than those shown in E, F and G. I couldn't give you the dates of the records of Long pistons, because I didn't bring a record of those dates, and I don't remember them. I did not find anything earlier than March, 1919.

I have heard of Frank Jardine. I should think he is a well-known piston engineer, who has worked for the Aluminum Company for a number of years.

Mr. Bruninga: That is objected to as having no foundation in the direct examination.

I have also heard of Howard E. Maynard, a well-known automobile engineer, who worked for Chrysler Company for a number of years. I met him personally.

I have also heard of Louis P. Mooers, a well-known automobile engineer.

I don't know who suggested putting the three ribs in the top of the Long piston instead of one, and I don't know when that was first done. I know this Exhibit G has got them.

Mr. Richey: Cross examination closed.

Re-Direct Examination by Mr. Bruninga.

I make my living by doing consulting engineering work. I have an office, and office expenses. I also have living expenses. I have a wife and six daughters. I did not have to come here, but came at your request, as an accommodation to you.

In order to have the piston satisfactory in an operating engine, there has to be a certain amount of clearance between the piston and cylinders.

I cannot now describe the Kant Skore piston which was mentioned on cross examination.

The Mr. Maynard whose name was mentioned on cross examination is Howard E. Maynard. To my knowledge, he was with the Maxwell and the Chrysler Companies. He was with other companies before being with the Maxwell. The Maxwell Company is not now in existence. I can't remember when it went out of existence, though. I understand it was taken over by Chrysler.

I saw pistons of the general construction of the Maynard patent 1,655,968, a number of years ago. The pistons referred to in my testimony did not have that I-slot in them.

When I was called to testify in 1926 I had practically no notice; that is, I remember that Mr. Long wired me to come to Detroit and I left the same day, or, at least, that night. I had very little preparation to refresh my memory before I got on the witness stand. We discussed a few questions, as I remember it, before I went on the witness stand, but very slightly.

I did not talk with Mr. Venner about the evidence I was to give in this case. It has been several years since I have seen him. There is no reason why I did not talk with Mr. Venner about this case, in the last week, except that you asked me not to talk with other witnesses not directly, but impliedly. I understood that I was not to talk to any other witness.

At the time that we were discussing, the honing process had not been developed, that is, in a production way, in our factory, and the cylinders were more or less rough and lifted this grinding fuzz. The cylinders were more or less uneven, due to the very minute channel marks in the wheels, and then the wheels were apt to leave a slight fuzzy surface, it would be like, under the microscope. That, in our case, gave the pistons a tendency to score when the engine was first started up, after being assembled. That is true in other pistons besides the Long, but that difficulty appeared in the Long piston rather seriously, during our experimental work. As I have already testified, the clearances on Exhibit B were three thousandths at the bottom and nine at the top; and in Exhibit E they ran four thousandths all the way

up, the clearance being less on Exhibit E than on Exhibit B. It probably had an effect on the tendency to score, with a new piston.

The honing process considers the use of a hone or a stone rubbed up and down and circumferentially with the cylinder, so as to smooth or remove the grinding marks. We did not employ that honing process in 1920, nor did we employ it while I was with the Franklin Company. It was not used until after 1924.

I remember drawing D-739X (included in Exhibit CC'), as having been furnished to the Franklin Company by the Aluminum Castings Company of Cleveland, Ohio. I couldn't identify the date it was furnished, but I should judge that it would be around February 11, 1919. I understand the construction of the piston shown in drawing D-793X; it is practically the same construction as Exhibit B piston. I have an idea that the Aluminum Company furnished that drawing to the Franklin Company because they were asked to make a mold for that piston, or were asked to quote us on a mold for that piston.

I do not remember drawings D-944X and D-960X. The Aluminum Castings Company never furnished pistons to the Franklin Company, like D-944X or D-960X, to my knowledge.

The following statement, which was a fact, is contained in Defendants' Exhibit D: "The Franklin engineers, however, realizing the particularly desirable features of the aluminum alloy piston, have for the past three years, been conducting exhaustive experiments with the view of securing a design such that the undesirable features would be eliminated." The statement, "That has been accomplished" was also true at the date of this bulletin, November 11, 1920. The use of the Long piston was the method referred to in that bulletin. That Long piston was similar to Exhibit E.

As to the test of Long pistons in which two pistons froze, and referred to in my cross-examination, as I remember, that test was made on a block, with a motor on the block, having Long pistons in it, and it was run under very severe conditions, the pistons having set up under conditions that the regular production pistons at that time would not stand, without seizing. That test is referred to in Exhibit Z, my report of March 18, 1919. In the second sentence it says, "Several tests have been run in connection with this piston, the first being a set-

up test on the block with baffle plates under the cylinders which did not give a sufficient amount of oil so but what a set-up was obtained in about nine minutes. This was a more severe test than we ordinarily give our regular production pistons such as we are now using, and it is doubtful even if the pistons were undercut as we recommend them to be for use in the southwest would stand up under this test any longer than these pistons did."

Mr. William M. Venner developed a piston of his own. I saw some of those pistons at the Franklin plant, in Syracuse. They were an aluminum alloy, slotted type piston, and had the portions of the skirt being supported by a web running down from the head. That was, in general, his design. That was some time after, or about the time we adopted the Long pistons in production, I should say. We tested those pistons, as I remember, but were not particularly impressed with their performance as compared with the Long piston. Their performance was probably better than the performance of Exhibit B.

I should say Defendants' Exhibit K was a sketch of the piston that Mr. Venner furnished us for a test.

When I made Exhibit Y, during my direct examination, I did not look at either of the Exhibits B, E, F or G to make the drawing from. You put those pistons in a box.

I never met Louis P. Mooers. I do not know where he is now.

Mr. Bruninga: Re-direct examination closed.

Re-Cross Examination by Mr. Richey.

Before I went on the witness stand to testify in the interference in 1926, I talked with Mr. Long and Mr. Fletcher, as I remember, or both of them. I do not remember anybody else with whom I talked.

In addition to being employed in this case in the manner we have talked about, only so far as to support my testimony, I have been employed to look up evidence for Defendant and interview other people about it. All my dealings in these matters have been with Mr. Bruninga. I have been told who the principal is.

RX. 8. You were told it was the Sterling Products Corporation, of St. Louis?

Mr. Bruninga: That is objected to as immaterial, at this stage of the proceeding.

Mr. Richey:

RX. 9. That is right, isn't it? A. Yes, that is right.

(Narrative continued) I expect Sterling Products Corporation to ultimately pay me for this work.

I can't tell you when I first saw pistons like shown in the Maynard patent, with the slot. I should say they have been on the market, with the slot in them, for a number of years, and in wide use, not only for replacements, but in production by a number of automobile companies. I don't think they were used with the slot in them by the Maxwell Company, but I am not sure of that to the extent that I could deny that they did have the slot in them.

I did not myself design any aluminum pistons, after the Franklin Company adopted the Long piston, with the idea of getting around the Long piston patents. I did design that oval piston, about which we talked yesterday, with the idea of getting out of paying a royalty. What I had in mind was, your first question related to Mr. Venner's piston, and that was more or less, to my mind, along the Long design. We didn't do any experimental work along that line, to get around the Long patent. We did use some oval pistons, which did not infringe or have anything to do with the Long patent. The oval piston is a trunk piston. We did experiment with the Long piston with the idea of improving upon it. I don't remember that we took out any patents on any aluminum pistons, after the Franklin Company adopted the Long piston.

Mr. Richey: That is all.

Re-Direct Examination by Mr. Bruninga.

The date I had in mind with reference to the Maynard piston without the slot, was around 1919 or 1920. I should say that at that time it did not have a slot in it.

I haven't seen Mr. Long for a long time; I can't remember the date. It seems to me not since the last time I testified, in 1925, in that interference proceeding.

I have not as yet been paid anything in this proceeding, and I do not know where the money is coming from, but I look to you to see that I get it. I am willing to trust you to pay me for it.

Mr. Bruninga: That is all.

Mr. Bruninga: I offer in evidence the depositions of William M. Venner, Charles L. Chadwick, James V. Saxton, Charles F. Gilbert, Sidney D. Royalty, and Louis M. Stellman, as Defendants' Exhibit 3-Y. The exhibits attached have been offered in evidence.

Thereupon LOUIS M. STELLMAN, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. Bruninga.

Q. You are the Louis M. Stellman who has previously testified in this case, as in the deposition just read? A. Yes.

Q. And you were in the court room during the greater part of the reading of that deposition? A. Yes, sir.

Q. You stated in your deposition that you graduated from the University of Michigan in Mechanical Engineering; and will you give briefly the general course, just as brief as you can? A. The regular course such as the University of Michigan offered its students to get a Bachelor of Science Degree in Mechanical Engineering.

Q. Did that include drafting? A. Yes, we had some drafting work.

Q. Design work? A. Yes.

Q. Design of machinery and parts? A. Yes, sir.

Q. Can you read drawings? A. Yes, sir.

Q. Have you read patent specifications? A. Yes, sir.

Q. Do you understand them in connection with the drawings? A. Yes, sir.

Q. Do you know anything about claims of patents? A. Not particularly, no, sir.

Q. You are not a patent expert then, are you? A. No, sir.

Q. You don't claim to be? A. No, sir.

Q. Have you ever testified in any court proceedings at all except the Long interferences and this deposition that has just been read? A. No, sir.

Q. You are not a professional expert in law suits then, are you? A. No, sir.

Q. Do you remember whether there was one or more depositions in these Long interferences; in other words,

did you testify just once, or a number of times? A. I testified once.

Q. Do you belong to the Society of Automotive Engineers? A. Yes, sir.

Q. Have you kept in touch with automotive engineers during the time you were with the Franklin Company and to date? A. More or less.

Q. What is your present business? A. Consulting engineer.

Q. Specialising in anything? A. In automotive equipment and engines in particular.

Q. You have received no medals, have you? A. No, sir.

Q. But you are the Louis M. Stellman to which the Court of Customs & Patent Appeals referred to as follows in 47 F. (2d) 369, at 370, the cause being Hartog v. Long, Interference appeal No. 2610: "Louis M. Stellman, a witness whose testimony displays an intelligent grasp of the situation, and who was at that time chief engineer of the Franklin Manufacturing Company." You are the one the court refers to? A. Yes, sir.

Q. I understood from your deposition you had experience with cast iron and aluminum trunk pistons? A. Yes, sir.

Q. Did that include the design and drawing of such pistons? A. Yes, sir.

Q. Have you had actual experience in the manufacture of such pistons? A. Yes, sir.

Q. And the machining? A. Yes.

Q. Have you ever had any machine shop experience? A. Yes, sir; before I went to college I had machine shop experience, and while I was in college. Of course since coming from college I have been intimately connected with machine shops and machine shop practice.

Q. You stated, I believe, that you took a student course at the Franklin Company. Did that include any actual machine work? A. Yes; when we left college we actually went into the shop and performed machine operations of various kinds.

Q. Have you had actual experience in the installation of pistons in automobiles? A. Yes, sir.

Q. Both aluminum and cast iron? A. Yes, sir.

Q. Have you had experience with the actual testing of aluminum and cast iron trunk pistons in automobile engines? A. Yes, sir.

Q. Did that include block tests? A. Block tests and road tests.

Q. Will you describe the general structure of a trunk piston as it existed in the beginning of 1915 in this country? A. A trunk piston had a head and a skirt integral with the head, attached to it were wrist pin bosses. In the head were grooves for slots in which piston rings were installed.

Q. Where were the bosses located in those pistons? A. In the inside of the piston skirt.

Q. Will you tell me whether there was any ribbing or webbing on the inside of such a piston and if so please describe it. A. There were ribs inside, often times running from the head to the wrist pin boss, to help support the boss. Other ribs in the head to stiffen the head and to help cool the head.

Q. How did that construction in use in 1915 compare with what is shown in Defendants' Exhibit M? A. I should say that was the fairly standard type of trunk piston.

Q. It had that web going across the head and extending down to the wrist pin bosses? A. Yes, sir.

Q. What was the diameter of the head with reference to the skirt in those pistons in 1915? A. The head down by and including the ring lands was usually several thousandths smaller than the skirt.

Q. And how was the skirt constructed? Was it cylindrical, straight up and down, or was it tapered? A. Why, often times it was tapered, being largest at the bottom and smallest at the top just below the ring lands.

Q. And was that the practice with the Frank Company in the beginning of 1915? A. Yes, sir.

Q. How about the ring, the wiper ring I, as shown on Plaintiffs' Exhibit 14; what was the practice in the beginning of 1915? A. Wiper rings of that type were often used to reduce oil consumption. The Franklin Company didn't use it at that time, however.

Q. Did you see it in use? A. I have seen it in use.

Q. What have you to say about the relieving, the practice of relieving the piston in the region of the wrist pin bosses on the outside? A. It is common practice to relieve pistons around the end of the wrist pin boss on the outside of the skirt.

Q. What was the extent of the relief? A. It varied from a few thousandths to a cast-in relief of quite considerable depth.

Q. How long has that been common practice? A. Back to 1909, I should say, from experience, and even farther back.

Q. And was that sort of relief employed at the Franklin Company? A. Yes, sir.

Q. When you came there? A. Yes, sir.

Q. When you say that relief was cast in, what do you mean by that? A. The portion of the piston skirt directly around the end of the wrist pin boss was so cast that after the piston was machined, that surface was left rough, that is, the bottom of the relief was rough and not machined.

Q. How did such a relief compare, for instance, with Exhibit 3-H? A. Exhibit 3-H, I would say was a machined relief of comparatively small depth, that is, the bottom of the relief would probably be may be a sixty-fourth of an inch below the cylinder wall as the piston was installed in the cylinder, while the cast relief would often times be deeper because of the irregularities of the cast surface.

Q. Are you familiar with the slipper piston, such, for instance, as the Ricardo and the Jardine pistons? A. Yes, sir.

Q. I mean the general structure? A. Yes, sir.

Q. What have you to say about the relief in those pistons? A. The design of that piston is such that the piston is automatically, actually has a large relief at the ends of the wrist pin bosses.

Q. In other words, that is an extreme relief? A. The wall is actually removed at that portion of the skirt.

Q. Now, you testified with reference to oval grinding and with reference to a particular oval piston. Where was the major axis of that piston? A. The longest axis was perpendicular to the plane of the wrist pin, the shorter axis being parallel to the wrist pin.

Q. What was the purpose of that oval construction as far as relief was concerned? A. That formed a relief at the end of the wrist pin.

Q. Would you say that was the equivalent of the relief? A. I should say so.

Q. What is the purpose of relieving the piston in the region of the wrist pin bosses? A. In cast iron pistons, I should say the purpose was to provide for a certain distortion of the piston skirt at the end of the wrist pin boss, so that there would not be undue friction between the cylinder wall and the piston at that point with the consequent scoring and trouble.

Q. Did it have anything to do with reference to expansion? A. Yes, sir. Of course it was not desired particularly to fit the piston tight in that direction because of expansion, and you could therefore give the relief there and allow for expansion in that direction.

Q. How about a piston that had a rib going across the top of the piston and connected with the wrist pin bosses; what effect did the relief have when such a construction was used? A. It took care of the expansion, which was rather great at that point, due to the rib, and also took care of the stiffening of the piston, due to that rib.

Q. Was that understood in the beginning of 1915? A. Yes, sir.

Q. Do you know whether any lightening of skirt was resorted to at all in the beginning of 1915; I don't mean necessarily in the Franklin plant; but as it came to your observation? A. It was of course considered desirable to make a piston as light as possible even in 1915.

Q. Was the cutting of holes ever resorted to? A. Yes, sir.

Q. What have you to say about the slipper type piston so far as securing lightness is concerned? A. Why, one would think with proper design the slipper type piston could be lighter than the ordinary trunk type.

Q. Do you know anything about the expedient of placing the oil groove below the lowest ring land in a Franklin piston? A. That was a common expedient: The oil groove just below the lower ring, with holes drilled through the surface of the piston to the inside.

Q. How early was that practice? A. I should say as early as 1909 that was done, 1910.

Q. Was that practice at the Franklin Company before you ever adopted the aluminum pistons? A. Yes, sir.

Q. You say that groove was perforated? A. Yes, sir.

Q. What was the purpose of perforating such a groove? A. To allow the oil to pass from the outer piston wall to the inside and back to the crank case.

Q. The Maynard patent shows the ring land J below the lowest ring reduced in diameter. Do you know what the purpose of that is? A. That was to provide a space for oil to gather and to pass from that space back into the inside of the piston, I should say.

Q. Was that practiced at all at the Franklin Company? A. Yes, sir.

Q. How early? A. Why, as early as 1910.

Q. I hand you United States patent to Howe 908,569. Have you read that patent? A. Yes, sir.

Q. Can you describe what you understand the purpose of that construction as described, is? A. That is the construction we have been talking about, with a circumferential oil groove just below the lower ring, having holes from the bottom of the groove to the inside of the piston for the drainage of oil from the outside of the piston below the lower ring to the inside.

Mr. Richey: I don't know what the purpose of producing this patent is, but I object to it on the ground that it is not set up in the answer, if you intend to rely upon it as a defense.

The Master: Same ruling.

Q. Where is the groove shown in that patent? A. It is shown slightly below the lower ring in the circumference of the piston wall.

Q. And the holes are in that; is that right? A. That is right.

Q. What is the diameter of the lowest ring land E with reference to the other ring land above it? A. The land E of the piston is reduced in diameter as compared to the other ring land.

Q. You say that was common practice then as early as what? A. As early as 1910, I should say.

Q. Only in the Franklin automobile? A. No; in general.

Q. What is the purpose of the rings on a trunk piston? A. The rings are used to seal the piston and the cylinder, the space between the piston and the cylinder, against the passage of explosion gases going down and against the oil working up.

Q. Those rings are split, are they not? A. They are usually.

Q. How long has that been the practice of splitting piston rings? A. Ever since they have been used; I should say for a good many years.

Q. Were they in use when you came to the Franklin Company? A. Yes, sir.

Q. And they are split for the purpose of permitting them to expand and contract; is that right? A. That is right.

Q. If they were not split, what would happen if the piston and the rings heated up? A. The rings would not follow the cylinder wall and of course would not form a seal.

Q. Well, if the rings were of the same diameter as the cylinder or were a few thousandths less when cold and then the engine heated up, what would happen? A. The rings would become larger than the cylinder and score or break.

Q. But if they are split, that will not happen? A. That will not happen.

Q. Do the rings perform any function at all of conducting away the heat to the cylinder wall? A. A very great amount of heat is conducted through the rings to the cylinder wall.

Q. Have you any figures on that at all? A. In airplane practice we considered that 90 per cent of the heat that the piston had was conducted through the rings to the wall.

Q. Have you ever had experience in airplanes? A. Yes.

Q. What has been your experience? A. I was with the Wright Company, a subsidiary of Curtiss-Wright, in their engineering department for about a year and did some consulting work after that with them, and had continual experience in connection with the building of airplane motors, which was the product they manufactured.

Q. What do you base your statement on about 90 per cent being conducted? A. That was the findings of the experiments and tests which they made and the general consensus of opinion of the engineers at that plant.

Mr. Richey: I object to the latter part of the answer as hearsay and speculation.

Q. But that is your opinion, is it? A. Yes, sir.

Q. Based upon experience? A. Yes, sir.

Q. On data that you know about? A. On tests and general use of the piston.

Q. Now, what is the effect if a piston skirt has a large clearance? A. Of course, in connection with airplane motor pistons it was customary and still is to use an ordinary trunk aluminum piston, which had to be given a rather large amount of clearance compared to the automobile practice, and the difficulty encountered with pistons having a large amount of clearance between the skirt and the cylinder wall was that we had considerable cocking of the piston in the cylinder which when it be-

comes too great, allows the rings to fail to function to a certain extent, which in turn allows the explosion gases to blow by the rings, heating the piston unduly in the cylinder wall, and it also allows the oil to work up by the rings into the combustion chamber to an excessive degree.

Q. The cocking of a piston is in a plane of the connecting rod, referring, for instance, to Exhibit 14? A. Yes, sir.

Q. And in order to overcome that it was simply necessary to support the piston on the thrust side? A. That is right, on the two thrust sides.

Q. What was the clearance of iron pistons in the Franklin car; you may give the diameter of the piston. A. In a 3¼" bore, that is a piston having an over all diameter of approximately 3¼", we used to allow two to three thousandths clearance between the skirt and the cylinder wall, on the diameter.

Q. Was there any call for compensation for clearance? A. Yes.

Q. Well, I mean so far as splitting was concerned in a cast iron piston? A. No.

Q. Was it necessary at all to do so? A. We didn't split the cast iron piston.

Q. Did you ever have to provide compensation for clearance; that is, automatic compensation by, for instance, splitting or some other means? A. No. The problem of clearance was small enough in the case of the use of the cast iron piston so the split pistons were not desirable or were not necessary.

Q. Do you know of any cast iron piston to-day that is split? A. You have one exhibit here in court.

Q. Yes, but I mean in practice, the motor practice? A. In an automobile, no.

Q. In other words, the cast iron piston to-day is used without any splitting or any other compensating means but the straight trunk type? A. It could be.

Q. Just relief opposite the wrist pin bosses? A. Yes, sir.

Q. When you come to aluminum pistons, aluminum has a greater co-efficient of expansion than cast iron, has it not? A. Yes, sir.

Q. In other words, a piston of say 3½" diameter of aluminum would expand a good deal faster under the same conditions than a cast iron piston; is that right? A. That is right.

Q. And that requires greater clearance, if you have nothing else at all? A. Yes, sir.

Q. What happens then, if you provide the same clearance in an aluminum piston as you do in a cast iron piston in the same engine? A. If you use the same clearance in aluminum as in a cast iron piston, the piston would probably stick, if the cast iron piston had a satisfactory, small running clearance.

Q. And that problem was encountered when aluminum pistons came into use; is that right? A. Yes, sir.

Q. You have heard Dr. Jeffries say that that was around 1915. Is that your recollection? A. Yes, sir.

Q. There was then no call for providing any compensation for expansion by splitting or otherwise until aluminum pistons came into use; is that right? A. That is right.

Q. You faced that problem I understood from your deposition, when the Franklin Company put in aluminum pistons? A. Yes, sir.

Q. And you tried it with a straight trunk piston first? A. Yes, sir.

Q. And you found out you couldn't operate at the same clearance; is that right? A. As with cast iron, yes.

Q. Now, who designed Exhibit B? A. I did; that is, it was designed under my supervision.

Q. But who conceived the idea, as far as you are concerned, of putting slots in that piston? A. I did.

Q. Why did you put them in? A. To provide flexibility at the bottom of the skirt so that we could run the pistons with closer clearance than with the unslotted ordinary trunk type piston.

Q. Did anybody have to tell you to put slots in that piston in order to compensate for expansion? A. No.

Q. You saw the piston rings right above it, didn't you, that were split?

Mr. Richey: I object to that as leading.

A. Yes.

Q. Do you think you displayed an extraordinary amount of ingenuity by putting those slots in that exhibit?

Mr. Richey: Object to it as immaterial.

The Master: He may answer.

A. I never thought it was a very great trick.

Q. When you said that compensation for clearance by splitting or other means was not necessary when cast iron pistons were used, did you have in mind pleasure cars or racing cars? A. Pleasure cars.

Q. What is the condition in a racing car? A. Conditions are much more severe in the racing car than in the ordinary pleasure automobile because of the fact they are driven with wide open throttle practically continuously.

Q. Do you remember what speeds cars were designed for in 1911? A. 50 miles per hour was considered a very high speed for passenger cars in 1911.

Q. And pistons did not seize with the clearance that you used at that time, cast iron pistons didn't seize? A. I wouldn't say they never seized, but it wasn't a common difficulty.

Q. What was your opinion as an engineer if the speed was stepped up to 70 miles per hour? A. The conditions are very much more severe under the higher speeds for pistons in an automobile engine, very much more severe at 70 miles than at 50 miles, because of the heat transmitted from the gases to the pistons.

Q. Was there any utility at all in splitting a piston for a racing car designed say, for fifty miles an hour, and operating at 70 miles an hour? A. I should think there might have been, yes, sir.

Q. If a racing car in 1911 with a piston, say 4½" in diameter, four-cylinder engine, such as the car that Mr. Monckmeier testified about, had a clearance very much greater than the clearance in use in the ordinary car, in what way was the efficiency affected? A. Well, of course, if the clearance was too great in a racing car, you would have trouble with cooking the piston and blow-by the rings, excessive oil consumption, and so forth.

Q. Would the blow-by the rings affect the power that the engine could deliver? A. Yes. The blow-by the rings would affect the power at all speeds but more at high speed than low. It also has a tendency and does heat the piston and the piston wall seriously.

Q. You have attended automobile races, have you? A. Yes.

Q. Isn't it rather important that there be a pretty quick start? A. Yes.

Q. Do you think the equipment of an automobile in 1911 with 4½" diameter pistons, four-cylinder, with split skirt pistons to permit compensation for expansion, was of any utility in a racing car designed to travel at fifty miles per hour and actually run at seventy miles an hour? A. I should say it would allow them to fit the pistons with less clearance, and the same clearance with less

drag on the cylinder walls, and would give some additional speed.

(Noon recess.)

(Thereupon, at 1:30 P. M., Monday, January 30, 1933, the hearing was resumed.)

Q. Have you examined the two large 4½" pistons, Defendants' Exhibits 3-V and 3-W? A. Not carefully, no.

Q. First examine 3-V. A. (Witness complies.)

Q. In a piston of that diameter, and 6" stroke, in a six-cylinder car as it existed in 1912 or '13, was there any utility or any advantage in having a slot as illustrated in that piston when used in a racing car traveling for instance at 70 miles per hour? A. I should say there was, yes.

Q. I notice that on one side the slot was not cut entirely through at the top. Does that tell you anything as to what kind of a tool might have been used for cutting that slot? A. I should say it might have been cut with a miller.

Q. Now, a miller is a round wheel, isn't it, a round cutting wheel? A. Yes.

Q. And if the miller was run right close up to the head, it would be liable to cut through into the ring land, isn't that right? A. Yes, if it was of too large a diameter.

Q. Do you know whether an operation like that sometimes happens, that a part is left in accidentally? A. Yes.

Q. In your opinion would it affect the utility of that piston to such an extent as to make it not useful at all in a racing car? A. No, especially as the slot on the opposite side seems to be cut all the way through from the bottom to the top, to the horizontal slot below the ring land.

Q. With a clearance of .015",—I believe that is what Mr. Monckmeier stated—would that piston operate more effectively in your opinion with it slotted? A. Yes. If as he said there apparently was some drag with .015" clearance without the slots.

Q. Now, this aluminum piston, Exhibit 3-W, have you examined that piston? A. Yes, sir.

Q. Does it look to you as if it has gone through a fire? A. I should judge it had been pretty hot.

Q. Will the skirt of that piston have any flexibility? A. Yes, it would.

Q. I notice that the horizontal slot is not right directly below the ring land. Do you see any reason why, in your opinion, why it might have been placed lower? A. One reason is the slot comes as near the piston head as it can on the inside because of the thickened portion of the head above the slot; also there is the relief around the piston at the point of the circumferential slot and slightly below.

Q. What is the effect of that relief? A. The relief is to allow plenty of clearance at the top of the skirt, above the slot.

Q. Where is the clearance, where is compensation for clearance, or clearance, mostly desired in that skirt? A. The portion of the skirt nearest the head.

Q. By "relief" you meant that circumferential band all around the piston; is that right? A. Yes.

Q. Can you tell whether or not that particular piston had a T-slot on the other side, from the character of the break? A. I should say it had a T-slot on both sides.

Q. What makes you say that? A. Because there is a circumferential slot, portions of it left on the broken-away side the same as on the side opposite.

Q. How about the little notch nearest the top, about in the middle of that circumferential slot; what does that indicate? A. It probably shows the milling cutter that cut the vertical slot struck that portion of the metal.

Q. Do you think a milling cutter was used on that particular piston? A. Whatever they cut it with. That was a hack saw. I think he testified it was a hack saw.

Q. In your opinion is there any utility added to that piston by slotting it with a T-slot, I am referring now to Exhibit 3-W? A. I should say there was.

Q. Do you think there was any utility by using that sort of a construction in a racing car, six-cylinder racing car of 4½" diameter and a 6" stroke? A. No doubt of it in my mind.

Q. I hand you a copy of the Van Bever patent 1,031,212. Will you briefly describe in what way that distinguishes, if at all, from the ordinary trunk piston? A. You note on the drawing of Fig. 1 they show some slots running from the open end of the piston through the piston skirt up to the center line of the wrist pin, and the same is shown on Fig. 4. There are evidently four of

these slots, two on each side of the plane through the wrist pin. This allows the bottom of the skirt to expand and contract with reference to the cylinder wall.

Q. What is the part 17 in Fig. 1? A. That is an expanding ring.

Q. What is the purpose of that expanding ring in that Van Bever construction? A. To expand the slotted portion of the piston. As I understand it, his idea was to take up for wear of the cylinder.

Q. In other words, as the cylinder got larger he could positively expand that and take up for wear, is that the idea? A. That is it.

Q. But if you take out that expander entirely, what would happen then if the skirt were made out of either metal or aluminum? A. If the skirt were made out of what?

Q. If the skirt were made out of either metal or aluminum, what would happen as far as expansibility or contractability were concerned, if that expander were taken out? A. Well, if the piston expanded itself so as to become larger than the cylinder, these slots would automatically allow the piston to contract at the bottom of the skirt.

Q. In what respect is that distinguished from Exhibit B? A. Very much the same idea as in Exhibit B.

Q. And you left the expander out of Exhibit B, that is the positive expander? A. We did in production, yes.

Q. In other words, the omission of that expander and its function would produce Exhibit B, is that right? A. Yes.

Q. And that would be true, the springing action would be true, whether the piston were made out of cast iron or aluminum? A. Yes, sir.

Q. I call your attention to the Rainfotth British patent 6826 of 1912. Have you read that patent? A. Yes, sir.

Q. Will you briefly describe its construction? A. This is a patent on a more conventional form of trunk type piston, except that the bottom of the skirt has vertical slots slotted through a portion of the piston which is evidently the portion intended to bear against the cylinder wall. These slots, as I understand the description, could either run as shown on the drawing, or the two Figs. 1 and 2, or the bottom of the slot could extend through the open end of the piston. This would allow the piston to have much the same action as we obtained with Exhibit B with the slotted skirt.

Q. What is the part, the band A in that British patent? A. That is a relief around the wrist pin and up pretty well toward the cylinder head.

Q. Well, if the slots D terminated as shown in Fig. 1, but started above the enlarged part and in the relieved part A, what have you to say about the working of that piston then? A. Well, it is evident to me that this piston was made so that the portion of the skirt between A^1 and A^2, can contract or expand, inasmuch as the slots run to the relief above this portion and also in the relief below the portion of the skirt that is slotted.

Q. I notice that in Fig. 2 the slots are at an angle. What is the useful function of that, if any? A. I think the idea was to have the slots, the ends of the slots overlap each other, so there would be no ridge or rib left inside on the cylinder wall due to wear.

Q. The specification, page 1, lines 12 to 14, reads as follows: "One or more slits may be used each of which may have both its ends closed and they may be made with their general direction along the length of the piston." What do you understand by that, that a number of slots have to be used, a large number as shown in the piston? A. It says, "one or more," not necessarily a large number, I should say.

Q. I now call your attention to the Vincent patent, 1,279,184. Have you read that patent? A. Yes, sir.

Q. Do you know who Jesse G. Vincent was at that time? A. Engineer for the Packard Company.

Q. He was chief engineer for Packard Motor Company, wasn't he? A. Yes.

Q. And the designer of the Liberty Motor? A. One of them, as I understand it.

Q. Now, in what respect does Fig. 7 construction on the second sheet differentiate from Exhibit B? A. I should say that it was essentially the same design except that the vertical ribs run farther along the piston skirt, that is, higher up on the skirt, more nearly approaching the ring lands.

Q. What is the part 15a? A. I judge it is an expanding ring, yes, an expanding ring in the bottom of the piston.

Q. Do you know whether that is a positive expanding ring, as described in the Van Bever patent, or is it a yielding one? A. A spring ring.

Q. How does that compare with the expanding ring you used in Exhibit B? A. Very much the same except

the cross section of our ring was circular instead of rectangular.

Q. Now, in this Vincent patent there is no specific description of a relief opposite, in the region of the wrist pin bosses. Would you expect that to be repeated in every patent from the beginning? A. No, I think that was the general practice, and more or less taken as an obvious construction necessary to make the piston perform satisfactorily.

Q. I next call your attention to the Schoengarth patent 1,174,022. Have you read that patent? A. Yes, sir.

Mr. Richey: Just a minute before you answer that. That is not set up in the answer. We object to that.

The Master: Same ruling. He may answer.

A. Yes, sir, I have read this patent.

Q. Describe that patent construction. You don't need to describe the engine, but the piston construction for instance as shown on Figs. 2 and 3? A. This piston is evidently a trunk type piston with a T-slot, or what might be called a Z-slot. The difference between this and the conventional T-slot being that the vertical portion of the slot runs on a distinct angle, on the piston wall, rather than vertical with reference to the horizontal slot.

Q. What relation if any does the particular slotting have to the T-slot piston such as shown in the Monckmeier pistons Exhibit 2-V and 2-W? A. I should say that the slot was such that the piston functions very much the same as one with a T-slot.

Q. Now, there is an expanding device shown on the inside for positively expanding that piston. Do you know what the purpose of that is? A. That was to allow the piston to be adjusted for cylinder wall wear by expanding the piston out against or toward the cylinder wall.

Q. Do you know what relation if any the piston illustrated in Figs. 2 and 3, that is, I mean now general construction, bears with a Ford piston in use at that time, in 1915, the Model T? A. Well, I don't think that the Ford piston had any slots in it at that time, but in general construction I should say it was generally that same piston without the slots.

Q. Now, the horizontal of the T-slot combination, where is that with reference to the bottom ring lands? A. Slightly below the bottom ring lands.

Q. And with reference to the wrist pin bosses? A. Well, above the wrist pin boss.

Q. Well, is it between or on a line with them? A. Circumferentially, you mean?

Q. Yes, circumferentially, is it in the region between? A. It is between but extends to the wrist pin bosses.

Q. Would you expect that relief to be shown on this piston? A. No. As I have already explained, relief around the end of the wrist pin was common practice at that time and would be expected. This piston would be expected to have one of some kind.

Q. What would happen if you didn't have a relief? A. Get scoring around the end of the wrist pin boss.

Q. Now, the patent says specifically "adjusting devices for adjusting the piston in diameter." Suppose that those adjusting devices are simply taken out, left off, how would that piston function then, if placed in a cylinder? A. You would have an automatically expanding and contracting skirt below the wrist pin lands.

Q. And if it had the reliefs in the region of the wrist pin bosses, in what way would its structure and mode of operation then distinguish from Defendants' Exhibit CCC, both if the adjusting devices were omitted and it had reliefs? A. I should say the mode of operation would be essentially the same as in the piston shown in Defendants' Exhibit CCC.

Q. What have you to say with reference to Defendants' Exhibit BBB? A. The same statement would apply.

(Short recess taken.)

Q. I hand you a piston which I will mark for identification Defendants' Exhibit 3-Z. Do you know what kind of piston that is? A. Yes, that is a Kant-Skore aluminum piston, I should say.

Q. Do you know what the name of the Kant-Skore Company is now? A. Aluminum Industries, I believe.

Q. How does that particular piston compare with the Schoengarth patent 1,174,092, I mean in a general way as to method of slotting? A. The slotting shown in the Schoengarth patent is somewhat similar to that on the Kant-Skore when one side of the piston skirt only is taken into account.

Q. How does that Kant-Skore piston compare with the Spillman Patent, 1,325,176? A. It is very similar to the Spillman patent.

Q. I notice that Kant-Skore piston has reliefs in the region of the wrist pin bosses. Can you tell by look-

ing at it whether those are cast in or machined in? A. Cast, I should say.

Mr. Richey: I will object to this piston and this patent both on the ground they are not set up in the answer.

The Master: Same ruling.

Q. How many slot combinations are there in that Kant-Skore patent? A. Kant-Skore piston, you mean?

Q. In the Spillman patent? A. There are two slot combinations in the Spillman patent. What might be called Z-slots or T-slots, one on each side of the piston skirt.

Q. The difference between the Kant-Skore piston and the Spillman patent on one side, and the Schoengarth patent on the other, is that there is only one slot combination on one side of the piston and that the extending along the piston starts from the middle of the circumferential slot rather than one end? A. That is right.

Q. I call your attention to the Long patent 1,395,441. Have you read that patent? A. Yes, sir.

Q. Will you briefly describe its construction, more particularly with reference to the side shown in Fig. 2? A. That shows a trunk type piston with a T-slot in the side. The circumferential slot forming the top of the T being slightly below the lower ring land. In this is also mentioned the fact that the portion between the T-slot and the lower ring land is or may be relieved so as to create a clearance above the T between the piston and cylinder wall.

Q. I call your attention to page 2, line 4, *et seq.* of the patent, which reads as follows: "In a piston of this improved character it is preferable to have the solid end 1 of the piston of a lesser diameter across the peripheral surface adjacent the piston ring recesses 2 than the remaining lower portion of the piston, said lesser diameter adjacent the solid end of the piston not being considered relative to this improved invention, as the usual type of piston rings mounted in the recesses will automatically take care of the proper expanding, contracting and packing relation relative to said solid piston end." What have you to say with reference to that description and with reference to the part above the slot 9a, as to what its diameter is? A. I understand that that diameter is smaller than the piston skirt, perhaps the same size as the ring lands above this portion of the skirt.

Q. In what way are the wrist pin bosses mounted in that skirt? A. As shown in Fig. 3 they are evidently

mounted on the side wall of the piston, and with the ribs running from the head of the piston to the wrist pin boss.

Q. Fig. 1, as I understand it, is a view from the reverse side of the piston than in Fig. 2. Can you just briefly describe that construction? A. Fig. 1 shows that the side of the piston on the reverse side from the T-slot is slotted so that there is a tongue formed by what might be called U-slots, the free end of the tongue being at the top of the piston skirt. Beside this tongue there is a slot running from the bottom of the skirt up into the tongue, making that side of the skirt rather flexible.

Q. The description, page 2, line 41, *et seq.* reads as follows: "As shown more clearly in Figs. 3 and 5, enlarged portions 12, each of which is reinforced by the rib 13, are provided for reinforcing the bearings formed by the wrist pin openings 10." What is the purpose of the pad 12 of the inside of that skirt, or rather the two pads shown in Fig. 5? A. The purpose of this rib is to reinforce the wrist pin boss and carry the load of the piston down to the piston head.

Q. Why do you think those were placed in there? A. Simply to rib up the boss and keep it from springing.

Q. Does the cutting of the slots 9a and 5 have anything to do with the provision of that rib? A. Yes, in a way it would make the side of the piston wall more or less flexible and call for a rib to support the piston boss because of the flexibility of the walls, perhaps.

Q. Look on the inside of Exhibit BBB and Exhibit CCC. What have you to say with reference to those inside reinforcements? A. I should say these wrist pin bosses were ribbed much the same way that they are in the Long piston shown in patent 1,395,441.

Q. I note again that the drawings of this Long patent do not show the relief in the region of the wrist pin bosses. You don't find that illustrated? A. No, sir. That evidently was not considered necessary in the patent drawing, although usual in performing the actual operation.

Q. Well, if you had a drawing of a piston like that before you, what would you say as to the construction on the outside in the region of the wrist pin bosses? A. I would think it would have to be relieved.

Q. How with respect to BBB and CCC? A. That would be a satisfactory relief on such a piston as shown in the drawing.

Q. And I understood you to say that was the usual thing in pistons at that time? A. Yes, sir.

Q. And I understood as far back at least as the early part of 1915, is that right? A. Yes, sir.

Mr. Richey: Oh, don't lead the witness.

Mr. Bruninga: He said that. I just want to connect it up.

The Master: I think he testified to that before.

Q. Now, in what way does Fig. 2 of the Long patent differentiate from Fig. 2 of the Schoengarth patent, if we eliminate the inside adjustments? A. Well, Fig. 2 of the Schoengarth and Fig. 2 of the Long are similar in that the side of the skirt has a T-slot in each.

Q. But the T-slot is vertical in the Long patent but on a slant in the Schoengarth patent; is that right? A. Yes.

Q. I want to call your attention to the Long patent 1,489,499. Have you read that patent? A. Yes, sir.

Mr. Richey: I object to that as not set up in the answer.

The Master: Same ruling.

Q. Will you briefly describe the construction of that Long patent?

Mr. Bruninga: It is to be noted here that counsel called this witness' attention to that patent during the taking of the deposition.

Mr. Richey: Not for the purpose of assailing the validity of any of the patents in suit.

A. This patent covers a slotted piston, one side, as shown in Fig. 2, having what is known as a tongue with two vertical slots, one on each side of the tongue, running into a horizontal slot below the lower right lands. On the other side of the piston there is a section of the skirt cut away by a system of vertical and horizontal slots, this section being supported by ribs running to the wrist pin bosses. This makes that portion of the wall flexible, and also the portion on the other side of the tongue is more or less flexible, above the slots, the horizontal slots, that portion of the piston is really of the same diameter, apparently, as the ring grooves, so that there will be no bearing on that portion on the cylinder wall during the operation of the piston.

Q. Referring to Fig. 5, which is a cross section, what parts are flexible? A. The parts 8a are supposed to flex, I judge.

Q. Do you think they would flex?

Mr. Richey: I object to that as leading.

A. I don't think that would be a very flexible construction, if that is what you mean. Perhaps—I understand it is the idea of the patent.

Q. But I am asking your opinion, with the construction shown in Fig. 5, will the webs 8s flex? A. Yes.

Q. How will they flex? A. When the piston shoves out against the cylinder wall, that portion of the skirt, of the webs, will bend.

Q. Away from each other? A. Yes, away from each other on the outside, the outer end of the skirt—outer end of the ribs.

Q. What happens to the intermediate part 4? A. That has to more nearly assume the straight line as the arc of the circle becomes greater.

Q. What are the slots 5-5 for? A. To allow this to happen, to take place.

Q. I call your attention to the Long patent 1,872,772. Have you read that patent?

Mr. Richey: I object to that as not set up in the answer.

The Master: Same ruling.

A. Yes.

Mr. Bruninga: I want to call your Honor's attention to the fact, as far as Mr. Long was concerned, he was set up as a prior inventor and prior user, and all of that. I want to also call your Honor's attention to the fact that the application for this particular patent, and the first Long patent, were in interference with the Jardine application of the patent in suit.

Mr. Richey: Also the Gulick.

Mr. Bruninga: Also Gulick.

Q. Compare the structure of this patent with Defendants' Exhibit F? A. I should say that Defendants' Exhibit F was essentially the same construction as shown in the Long patent 1,872,772.

Q. I note that the slot 9, or rather two slots, don't go all the way around Exhibit F. Is that a distinction? A. These slots don't go all the way around? You mean in the drawing?

Q. In the drawing, don't go all the way around. A. No, as far as the operation of the piston is concerned,

I shouldn't say there was a distinction. That is a fact, however.

Q. How about the reliefs on Exhibit F; they are not shown on the drawings? A. The reliefs around the end of the wrist pin boss is not shown on the drawings, although there is a relief on the actual piston, Exhibit F.

Q. Well, how about those pistons that Long brought over to the Franklin Company that you have testified about, particularly like Exhibit F. Can you state anything as to the relief? A. Yes, he had the relief around the end of the wrist pin boss.

Q. How does Exhibit E compare with that Long patent? A. In principle, I should say the piston shown in E was the same as shown in the patent. There is some difference in the internal ribbing between the head and the wrist pin boss.

Q. There are three ribs instead of one, is that right? A. Three ribs instead of one.

Q. The relief in Exhibit E, that is cast in, isn't it? A. That is right.

Q. I notice also the slots on the outside corresponding to 8-8 in the patent are inclined in the Exhibit E; that is another distinction, isn't it? A. Yes, but that would not affect the operation of the piston as I see it.

Q. Now, what have you to say about Exhibit G, in what way is that distinguished from the Long patent? A. That is practically the same piston as shown in that patent.

Q. How about the reliefs? A. The reliefs are cast in.

Q. How about the internal ribbing? A. It has three ribs instead of one, as shown in the patent.

Q. How about the large relief right underneath the head of the piston? A. That is cast in.

Q. Do you know what the purpose of that large relief was? A. Simply to allow the tool to run out there and not to give a sharp corner at that point, I judge, in the supporting member to the wrist pin boss; also saves weight.

Q. I call your attention to British patent to Hives, 140,988, accepted April 8, 1920.

Mr. Richey: I object to that as not in the answer.

The Master: Same ruling.

Q. Have you read the specification of that patent? A. Yes, sir.

Q. Can you briefly describe that piston? A. That is essentially a trunk type piston with a T-slot on one skirt. This T-slot is described as being used to run from the open end of the skirt to the horizontal slot or to stop in another slot near the lower edge of the piston, as shown by the dotted lines in Fig. 1.

Q. I want to call your particular attention to page 1, line 33 et seq., reading as follows: "The effect of such saw cuts is to give an elasticity to that part of the skirt between the circumferential saw cut and the edge, or between the two circumferential saw cuts as the case may be, and thus enable us, as we do, to machine that part slightly oval so that when cold the piston is held in close contact with the other side of the cylinder, and yet when heated that part of the skirt can contract and avoid risk of seizure." Can you tell us what your understanding is of that matter, as one skilled in the piston art? A. I understand from this descripton that this piston was mounted and ground so that the section taken through the skirt, as shown in Fig. 2, would be slightly oval shaped, the large diameter being on a diameter perpendicular to the wrist pin, the smallest diameter of the oval being parallel to the wrist pin.

Q. What would that give in the region of the wrist pin bosses? A. That would give relief in the region of the wrist pin bosses.

Q. Where would the ends of the horizontal slot run with reference to the skirt? A. The ends would be in the relief portion of the skirt.

Q. How does that operation compare with the oval grinding that you have referred to in your deposition? A. It would give a piston of an oval shape similar to that used by the Franklin Company.

Q. And what have you to say about a relief such as shown for instance in Exhibit CCC, or Exhibit BBB, and the oval relief of the British patent; how do they compare? A. The oval relief would perform much the function as the cast-in, or machined relief which is on Exhibits CCC and BBB.

Q. Can you tell me whether or not the reliefs would be equivalents?

Mr. Richey: I object to that question as leading.

The Master: Same ruling.

A. I would say they would, yes.

Q. Now, I want to call your attention to the Franquist patent, 1,153,902. Have you read that patent? A. Yes,

Q. Will you describe briefly the construction of that piston so we will have it again before the Court? A. That is a piston with vertical slots in grooves running from the open end to a horizontal slot. These vertical slots being four in number, so dividing the piston that there is a pad on each side of the piston perpendicular to the wrist pin bosses. There is also a relief on the portion of the piston between these vertical slots which support the wrist pin boss, this relief being around the end of the wrist pin.

Q. Now, the specifications states, page 2, lines 11, et seq.: "The sections 14-14 which carry the piston pin bosses, remain integrally connected to the piston head 2 and are relieved from a point on the level with the rearmost piston ring to a point below the piston pin bosses, approximately .005 of an inch on the side, to insure that upon the expansion of the piston the portion of the sleeve which carries the bosses will be prevented from sticking to the cylinder walls, and causing either the motor to stop, or the breakage of the parts." Will you refer to Fig. 1 and tell me, if you can, the extent of the relief downward? A. On Fig. 1 I should say from the drawing that that relief ran from the top of the skirt below the ring land to the bottom of the skirt.

Q. In what way does such a relief compare with oval grinding with the short axis parallel to the wrist pin bosses? A. The relief would be the same, the effect of the relief would be the same as in the Franquist piston where oval grinding is shown.

Q. Now, there is a slot, there is a definite slot 17, on each side of the piston in that construction. The patent specification says, page 2, line 6, et seq.: "Circumferential slots 17-17 are cut in the outer surface of the sleeve in the sections 15-15 respectively, which slots extend to and join the longitudinal slot of 13, separating the longitudinal sections 15 from the head of the piston." Is it your understanding from that description that it is necessary that the horizontal slot be located in the ring groove at the bottom of a ring groove?

Mr. Richey: Objected to as leading.
The Master: He may answer.

A. Not from the specification, I should say.

Q. Well, the horizontal slot as shown in Figs. 1 and 2 seems to be located at the bottom of the ring groove; is that right? A. That is right.

Q. Now, I believe you heard Dr. Jeffries testify that that would cause transmission of heat, ready transmission of heat, and would not effect much isolation between the head and the skirt. What is your opinion on that? A. Well, as I have already testified, the rings conduct the majority of the heat from the head to the skirt, and if there was a ring in this groove, that would help to conduct the heat to the cylinder wall. I mis-spoke myself first. I didn't mean conduct the heat from the head to the skirt, but from the head to the cylinder. And if there was a ring in this groove, it would help to conduct the heat to the cylinder wall rather than to pass it onto the skirt. Also I should say the ring there would help to insulate the head from the skirt.

Q. Now, the Mooers patent 1,402,309, specifically states, page 2, line 30, et seq: "It will be understood that this relationship might be that of a poor mechanical fit or joint which would be a poor conductor of heat, as compared with the metal of the head 2 and connectors 3, so that such heat as did pass from the head 2 to the skirt 1 would do so principally by way of the connectors 3, rather than from the head to the upper end of the skirt 1 directly." What have you to say now with reference to the slot 17 of the Franquist construction, as compared with the quotation from the Mooers patent? A. I should say the slot 17 had much the same effect as the slot in the Mooers patent.

Q. Now, in the Mooers patent, however, there are narrow connectors 3 distributed around. Do you find such narrow connectors in the, for instance, Plaintiffs' Exhibit 1? A. Not identical, not the same type connectors.

Q. How do those connectors compare with the connectors of the Franquist patent? A. These connectors, I should say, would amount to about the same thing as in the Franquist patent.

The Master: You are speaking now of Exhibit 1?

The Witness: Yes.

Q. You mean of Exhibit 1. The connectors of Exhibit 1 are about the same as in the Franquist patent; is that right? A. Yes.

Q. And they each extend about 90 degrees? A. Each extend 90 degrees, total about 180.

Q. You don't find any connectors as wide as that in the Mooers patent? A. No, sir.

Q. Neither do you find them in Exhibit 1, do you? A. No.

Q. Now, the Franquist patent also describes these pads 17-17 which are connected with the part carrying the wrist pin bosses by elements 12. What is the nature of those elements? A. Those elements are slots or grooves such that when the piston expands they are supposed to flex in this patent.

Q. He, however, says, "One embodiment of such a construction is shown in my drawings, and will now be described." What do you think from that, that only the specific constructions have to be used, the specific slots? A. No, I should judge he intends that there might be more than one construction of those, or different constructions of those slots; he only describes one, however.

Q. What could be done to make the structure more flexible, for instance, as shown in the model Defendants' Exhibit 3-Q, which has identically the same proportions as shown in the patent (Franquist)?

Mr. Richey: Wait a minute, are you testifying on that or does the record show that?

Mr. Bruninga: The record shows that.

Mr. Richey: All right, beg pardon.

A. The walls of this piston and these slots may be made thinner, the length of the slot could be increased, which would increase the lever arm and make the slots more flexible. Those are two of the things that I could see off-hand could be done.

Q. And what would happen if you cut all the way through a slot on one side of the wrist pin, one on either side? A. That would make that side of the skirt adjacent to this cut very flexible.

Q. In what way would such a construction distinguish from the Hartog patent 1,842,022?

Mr. Richey: Object to that as immaterial.

The Master: Same ruling.

A. The function of the Franquist piston when slotted as you suggest would be similar to that obtained by the construction shown in this Hartog patent.

Q. With reference to the connectors, then, the connectors from the head to the skirt, comparing Exhibit

1 with the Franquist patent and with the Mooers patent in suit, state which exhibit more closely resembles in that respect. A. I should say that Exhibit 1 was practically the same as that shown in the Franquist patent, and quite different from those shown in the Mooers patent 1,402,309; the Mooers patent being distributed all around the head, between the head and the skirt, while in the Franquist and the Exhibit 1, they are confined to the two sides over the wrist pin boss.

Q. How about the reliefs in Exhibit 1 and in Franquist? A. Very much the same as far as operation is concerned. In Exhibit 1 they are cast in, and very deep, while in the Franquist patent they are apparently machined in and are only .005" in depth, but the operation of the two reliefs would be approximately the same.

Q. Will you briefly describe or compare an ordinary double-acting steam engine piston with a cross-head, a cross-head piston and an ordinary trunk piston? A. In a double-acting steam engine we have the piston head so arranged that the power of steam can be applied to either side of the piston and push and pull the piston head. This piston head is then connected to a cross-head, which runs in guides, and from there to the crankshaft by the usual connecting rod. This cross-head is entirely separate from the piston and is connected to it by a suitably long piston rod. In the so-called cross-head type piston the cross-head is much nearer the head of the piston, that is the cross-head portion of the piston is much nearer the head than in the steam engine, but the same designation can apply because the force of the piston bearing on the cylinder wall is entirely from the piston head, except by inside connectors, which, when you are referring to the steam engine, would be the piston rod. In the trunk piston, however, as used in an automobile motor, the skirt of the piston and the head of the piston are one piece, there being no separation between the head and the skirt. I think that is the essential difference in the three types.

Q. I call your attention to the Roots British patent 19,559 of 1890. Have you read that and do you understand that structure?

Mr. Richey: I object to it as not being cited in the answer.

The Master: Same ruling as the others.

A. Yes.

Q. Will you describe the Fig. 2 construction? A. Fig. 3 is the cross-head type of piston and connecting rod construction, A representing the head, and B representing the cross-head. The portion representing the, pointing to the arrows, E points to the point of support between the cross-head and the cylinder wall.

Q. What is the part B in Fig. 3? A. That is the connecting rod, what might be called a single ended rod, fastened into the cross-head E by a pin between between two bearings.

Q. In other words, there is a pin between two separated parts, is that right? A. Two separated bearings.

Q. What is that sort of connection called in practice, has it any name? A. That is the locomotive type of rod.

Q. That is the locomotive type of rod in which you have the connecting rod or the pitman between the two bearing walls, is that right? A. That is right.

Q. What did I understand you to say that general piston structure represents? A. That is a cross-head type of construction.

Q. I will now call your attention to the Ebbs patent 700,309. Have you read that patent? A. Yes, sir.

Q. What type of construction does that represent? A. That might be called the cross-head piston, in that the skirt is separated from the head by circumferential slot, and the piston head is joined to the cross-head by an internal strut.

Q. I want to call your attention to the statement in the specification, page 1, line 31, et seq.: "Then, again, the large area connecting the rearward and forward piston parts, causes the distribution of very considerable heat from the rear to the forepart of the piston, thus considerably increasing the amount of friction generated in the straight guiding of the four piston parts." What does that convey to your mind as one skilled in the art? A. Well, it refers, I judge, to the conduction of the heat from the head to the piston skirt.

Q. Now, can you briefly describe the construction of that patent? A. This patent is so arranged that there is a comparatively small amount of heat conducted from the head to the piston skirt or cross-head because of the circumferential slot shown between the head and the piston.

Q. Now, what is the construction, how is that attained, describe it by using the reference numerals, a, b,

and so forth? A. The portion d joins the cross-head with the head, and is screwed into the head, as shown by the threaded portion in the upper part of the cut. This portion d joins the cross-head c which carries the wrist pin and also carries the skirt f. This particular construction evidently is used as a forked rod, with the bearing outside of the web shown at c.

Q. And what practice does that represent? A. That is what is called the marine type of rod.

Q. That is the marine type of rod in which you have a forked connecting rod taking over a bearing, a small bearing, is that right? A. No.

Q. Now, suppose you wanted to use a locomotive type construction as illustrated in Fig. 3 of the Roots British patent, what would you do then with that structure in order to secure that kind of connection? A. You would have to separate or make a portion of the part shown at c so that the rod could extend in to this, and the bearing kept on the outside of the rod rather than in the middle.

Q. Now, keep these patents before you and examine the Spillman & Mooers patent 1,092,870. Have you read that patent? A. Yes, sir.

Q. What does that piston represent, a trunk piston or a cross-head type piston? A. A cross-head, I should say, essentially a cross-head type.

Q. How is the connecting rod attached to that piston? A. The connecting rod is attached to what is called the locomotive type where the bearings are outside of the rod, the bottom of the skirt forming the support—or the ribs to the head of the bearing forming the support.

Q. As distinguished from the Ebbs type, which is the marine type; is that right? A. That is right.

Q. Now, employing the Spillman & Mooers patent, or the marine type in the Ebbs patent structure, would you get any essentially different construction?

Mr. Richey: Objected to as leading.

A. Not so far as the operation of the piston was concerned.

Q. In other words, the distinction between those two structures, as I understand them, is that the connecting-rod is between two bosses rather than a single boss between two forks on the connecting-rod?

Mr. Richey: Same objection.

The Master: Same ruling.

A. That is all the difference.

Q. Now, the parts *f-f*, what do they form together in the Ebbs patent? A. They form the slipper portion of the cross-head which bears against the cylinder wall.

Q. What name can that have, if you use the same terminology as in the trunk piston? A. The skirt.

Q. Now, I notice right below Fig. 2 there are two spaces shown. What do those represent? A. They represent slots which divide the circumference of this piston into two parts or slippers.

Q. Now, I notice that in the Spillman & Mooers patent structure the head is connected with the skirt at the bottom, and in the Ebbs patent the head is connected with the skirt about the middle. What is the difference? A. Well, the difference, fundamentally, I would say would be that perhaps the point of support in the Spillman & Mooers being a little farther removed from the piston head, would make the temperature of the lower end of the skirt a little lower than in the Ebbs. In the Ebbs the connection is about half way between the top and the bottom of the skirt.

Q. The Spillman & Mooers patent 1,092,870, reads as follows, page 1, line 71: "In the construction illustrated in the drawings, the web is separated from the surrounding walls of the head and guide sections by a comparatively wide space, and the upper end of this connecting web joins the back of the head section, while its lower end joins the guide-section near its lower end or at a point remote from the non-conducting gap 6, whereby the amount of heat transmitted through the web from the head to the guide section is reduced to a negligible degree, not only on account of the remoteness of the lower end of the web from the gap, but because the web is constantly cooled by the large volume of oil in the crank case." When the expression is used "near its lower end or at a point remote from the non-conducting gap 6," do you understand by that that the connection must be made just exactly as shown in the drawings? A. No, I shouldn't say just as shown in the drawings, but somewhere between the bottom of the skirt and the center of the wrist pin.

Q. Well, consider that Spillman & Mooers patent, for instance, Fig. 2, and keep on raising the connection, and tell the court what would happen as far as perhaps a compromise is concerned, between the two? A. If you will raise the point of connection between the skirt and

the supporting member, you will gradually get the point of support up to say the center of the wrist pin boss, where you have equal distribution of heat throughout the whole of the skirt section; and to my mind it would be a very good construction.

Q. Well, suppose you keep going up still farther?

Mr. Richey: Oh, I think this is immaterial. I think you have to consider what the man shows in the patent, and what is in the prior art; not as this witness wants to change it around.

The Master: He may answer; same ruling. It will save time, I think.

A. Well, if you went up, continued to go up, of course you would get unequal distribution of the heat and the top of the skirt would be the hottest.

Q. What have you to say about the Mooers patent 1,402,309 in that connection? A. That is what happens in the Mooers patent.

Q. Do you get as efficient transmission of heat in the Mooers patent structure as you do in the Spillman & Mooers patent structure? A. I should not think so, no.

Q. I call your attention to the Spillman patent 1,229,540. What is the difference between that patent construction and that of the Spillman & Mooers patent 1,092,870? A. The wrist pin bosses in the Spillman & Mooers patent are supported by the skirt and independent of the vertical struts or webs which support the skirt, while in the Spillman & Mooers the wrist pin bosses are supported by those webs which support the skirt from the head.

Q. Now, the connection is again to the bottom of the skirt, isn't that right? A. That is right.

Q. Do you know whether the purpose is the same or different as in the Spillman & Mooers? A. The same.

Q. Well, suppose you keep on running that connection up the side of the skirt, what effect does that have upon a compromise, efficiency, and anything else? A. You would get the same effect as you did in the Spillman & Mooers, in that you get a more equal distribution of heat until you get up, as you reach the center, as you went by the center to the top of the skirt, the top of the skirt would get hotter as compared to the bottom.

Q. Do you know whether the Spillman & Mooers patent structure has ever gone into commercial use? A. I understand it did.

Mr. Richey: I object to what he understands as incompetent.

Q. Well, do you know? A. I know it did, yes.

Q. What company used it? A. A motor concern at Tonawanda,—Sterling Motors.

Q. Sterling Motors Company. Do you know the Herschil & Spillman Company? A. Yes; Herschil was the one.

Q. What about Herschil & Spillman? A. They used the Spillman & Mooers piston.

Q. Now, that Spillman & Mooers patent structure seems to have originated in 1913, the application being filed July 18, 1913. Were aluminum pistons in general use at that time? A. No, sir.

Q. Was there any necessity of splitting that skirt of the Spillman & Mooers patent structure at that time? A. Not if made of cast iron.

Q. Not if made out of cast iron. And did the separation of the skirt from the head have any effect upon permitting temperatures to be run higher than a straight trunk piston? A. Yes; I would say that the piston would lend itself to operate with comparatively small clearance between the cylinder and the piston.

Q. Now, let's take the situation when aluminum pistons came into use, and you as an engineer had been called upon to design that piston of aluminum alloy for an automobile, and with the high co-efficient of expansion of aluminum, what would you have done in 1915?

Mr. Richey: I object to that as too highly speculative to be material.

The Master: This man is here as an expert. He may answer the question. You may cross examine him about it.

A. It is evident to me that the thing to do would be to slot the piston.

Q. Split the skirt; is that right? A. That is right.

Q. Did you have any precedent for that? A. That is what we did in the Exhibit B, we split the skirt from the bottom up as far as we could. Of course the logical thing to do in this piston would be to split the skirt all the way from the bottom to the horizontal slot.

The Master: Which one are you talking about now?

The Witness: The one in the Spillman & Mooers patent 1,092,870.

Q. In addition to the split in piston rings, were you familiar in 1915 with railroad rails? A. Yes.

Q. And how were those rails laid? A. They were laid with expansion joints between them, which corresponds to a slot.

Q. Would that have been necessary if the temperature of the particular country would not have varied more than ten degrees? A. I should say not.

Q. But with winter and summer, with the extremes of temperature, it was necessary? A. Yes.

Q. And that provided a gap between the rails? A. Yes, so they could expand and contract.

Q. Do you know of any other instances where slots are placed between two parts in order to compensate for increase in temperature and expansion of materials? A. Well, you take bridge construction, for instance, one end of a bridge is free to expand and contract, some times when the other is fastened permanently. They often times put large rollers under one end of the bridge so it can expand and contract, a common, ordinary construction. Piston rings are made that way. That was a common, ordinary construction as used in the automobile industry, slotting the rings so they can expand and contract.

Q. Well, if you wanted to split the piston of the Spillman & Moore patent structure, where would you split it? A. I would split it on a line, on one side of the skirt, on a line perpendicular to the center line of the wrist pin.

Q. And where would you have split it in 1915, in the early part of 1915, assuming that you wanted to make it out of aluminum?

Mr. Richey: I object to this as immaterial. There is a host of authorities to the effect it is not proper to go back and use hindsight; an expert's opinion of that kind to invalidate patents. That is all he is doing.

The Master: The same ruling.

A. The same applies as I have described.

Q. Between the wrist pin bosses? A. That is right.

Mr. Brumings: Is the translation of the Chenard & Walcker patent satisfactory?

Mr. McCoy: Oh, we think so, in general. I haven't checked it up carefully. I don't think there will be any differences.

(Short recess taken.)

Q. I hand you a copy, photostatic copy, of French patent 468,595, to Chenard & Walcker, together with a translation. Have you read a translation of that patent? A. Yes.

Q. Will you briefly describe that particular piston? A. This is a trunk type piston with the skirt separated from the head by the horizontal slot A, B, and ribs running from the head and the wrist pin boss, supporting the skirt, through the wrist pin boss.

Q. In what way does that particular structure shown in the Chenard & Walcker patent distinguish from the Ray Day piston, Plaintiffs' Exhibit 8? A. With the exception of the vertical slot on one face of the piston, I would say this piston was practically described in the Chenard & Walcker patent.

Q. Can you see any difference between them at all? A. I don't, with the exception of the slot.

Q. In other words, slotting the Chenard & Walcker piston, would you have any difference between such a structure and the Ray Day piston, Plaintiffs' Exhibit 8? A. In operation, no.

Q. Would the structure be any different at all? A. The structure is somewhat different, due to internal ribbing.

Q. You mean the internal ribbing on the inside? A. Yes. And also the relief is shown on the Ray Day piston which is not shown on the Chenard & Walcker.

Q. But again, with reference to that relief, what do you understand by the following statement in the patent: "We know that the pistons of this type make the cylinders oval and, in order to avoid this objection, we have given them a cross-section quite complex which we obtain on the copying lathe, so that through expansion they will be exactly applied against the wall of the cylinder." A. That said they ground the piston oval so that there would be a relief around the wrist pin bosses similar to that, in effect, as shown in the Ray Day piston.

Q. Does the patent limit the structure to one in which the ribs *d* are exactly as shown? A. No; as I understand,—as I remember the patent, it said that those ribs could be placed anywhere with respect to the side walls of the piston and the head.

Q. Part of the specification reads as follows, on the second page of the translation: "In the mode of construction shown, the partition *d* which connects the two parts *a* and *b* of the piston, are parallel, but it is evident

that they might constitute a cross-piece or be disposed in any other way. We can even replace these rectilinear partitions by a single circular partition, if desired, but always having a cross-section as slight as possible in order to reduce to a minimum the transmission of the heat from the part *a* to the part *b*." Does that read as if the construction is identical with that illustrated? A. No; it gives a very broad disposition of those ribs.

Q. Neither the Chenard & Walcker nor the Spillman & Mooers patent states that the part *d* of Chenard & Walcker or the parts 8 of Spillman & Mooers are flexible; neither of them state that, do they? A. No, sir.

Q. But with the parts of the dimensions as shown in the particular patent drawing, if the skirt of Chenard & Walcker or the skirt of the Spillman & Mooers patent structure were split between the wrist pin bosses, what have you to say as to rigidity or flexibility? A. I should say the skirt would be very flexible in either one of them, when the skirt was split with a slot running from the bottom of the skirt to the horizontal slot.

Q. I call your attention to Exhibit 3-P. Dr. Jeffries said that is a fair representation of the Spillman & Mooers patent structure; that is, except for the splitting of the skirt. Do you agree or disagree with him? A. I would say that is a very flexible piston, yes.

Q. That splitting of the skirt is, however, between the wrist pin bosses? A. That skirt is split between the wrist pin bosses, yes.

Q. What do you find as to its flexibility? A. Very flexible.

Q. I notice that there is a wrist pin in that piston. Does that add or detract anything from the stiffness? A. I should say it detracted from the flexibility very materially, because a wrist pin is tight in here, tighter than it would be in the actual operation of the engine.

Q. If you took the piston structure as shown in the Spillman & Mooers patent and as shown in the Chenard & Walcker patent and made a piston of that kind and split it between the wrist pin bosses and put it in a cylinder, could you stop it from contracting as the heating went on? A. Not when she warmed up.

Q. The slot contracts; is that right? A. That is right.

Q. And the piston as a whole expands? A. That is right.

Q. I want to call your attention to the White patent 1,195,936.

Mr. Richey: That is not in the answer either. I object to it as not set up in the answer.

The Master: Same ruling.

Q. Have you read that patent? A. Yes.

Q. What does that generally represent? A. A cross-head type of piston.

Q. Well, how about a slipper piston? A. Slipper.

Q. Is it also called a slipper piston? A. Yes.

Q. In what way does a slipper piston distinguish from the trunk piston? A. The slipper piston has portions on the skirt at the ends of the wrist pin bosses cut away so that only those portions of the skirt perpendicular to the wrist pin bosses are in contact with the cylinder.

Q. Where is that head on that piston; what indicates the head? A. No. 4.

Q. And what number represents the slippers? A. No. 6.

Q. Is there any peculiar connection between the pitman and the piston, and particularly the construction of the piston as far as relation of slippers and head is concerned? A. No.

Q. I call your attention to Ricardo patent 1,294,833. Have you read that patent? A. Yes.

Q. What type piston does that represent? A. That is the slipper type piston, the cross-head type.

Q. Do you know who Ricardo is? A. Yes; I understand he is quite a noted British engineer.

Q. He has written in magazines a good deal, I think? A. Yes.

Q. And he is a text book writer, too? A. Yes, quite a noted engineer.

Q. How is he regarded in the automotive industry? A. Very well, I think.

Q. Now, if you find, or if you would have found in 1918 that such a piston made of aluminum alloy would seize in the cylinder, what expedient would you have resorted to? A. Slotted the skirt opposite the wrist pin or perpendicular to the wrist pin between the two webs.

Q. In 1918 you had already split a skirt, as I understand, of the structure that the Franklin used in 1916; isn't that right? A. Yes.

Q. If you would have had a slipper piston in 1915 or at the time that you started to split that skirt, would

you have proceeded differently? A. No; I should say the same procedure would be followed.

Q. And what happens if you split the slippers vertically of the Ricardo piston structure and you put it in a cylinder with a small clearance and the temperature goes up? A. The webs marked C would flex and the piston would have been made flexible.

Q. Could you stop those webs from flexing with the ordinary construction as used in slipper pistons? A. Not if made with such amount of metal as shown in the drawing in the webs.

Q. In what way, if any, does the Ricardo piston structure differentiate from the Jardine patent structure of the Jardine patent in suit? A. I would say essentially the difference was the slot in the slippers, in each slipper.

Q. Well, you do have some fancy ribs 27 and 27a, don't you? A. Yes.

Q. In Jardine? A. I don't see how they would affect the operation of the piston.

Q. And you also have a fancy curve from the ring flange down to the skirt, haven't you, that Mr. Ricardo hasn't got? A. You mean in the slot?

Q. Oh, I mean this fancy curved web from 23 down to the main web. A. Yes; but I don't see how that would affect the operation of the piston.

Q. I don't either. I am asking you. Now, Mr. Ricardo has overhanging slippers, as shown, for instance, in Fig. 3, which overhang. Why do you think those are overhanging that way,—for any useful purpose at all? A. Well, it gives them a wider slipper bearing with that arrangement of webs.

Q. But it does prevent him from getting out a mold piece, doesn't it? A. Yes.

Q. And in 1915, or even when you were a boy, what would you have done if you had found such a condition? A. Cut them off if I wanted to get the mold out.

Q. Do you think you would have displayed an enormous amount of ingenuity by doing that?

Mr. Richey: I object to that as immaterial.

Mr. Bruninga: I know; but some of these things in these patents are simply absurd.

Q. Now, I call your attention to the Anderson patent 1,283,021. Have you read that patent? A. I don't think I have.

Q. Well, can you read drawings? A. Yes.

The Master: Well, it is after four o'clock. He can read that patent to-night.

(Adjournment to the following day, at 9:30 a.m.)

(Thereupon, at 9:30 A. M. Tuesday, January 31, 1933, the hearing was resumed.)

Q. Did you read that Anderson patent last night? A. Yes.

Q. Now, compare these slippers of the Anderson patent with those of the Ricardo patent as far as extensions beyond the webs are concerned; and state what you find? A. The extensions are cut off on the Anderson patent at compared with the Ricardo patent, the extensions of the slipper beyond the web are cut off.

Q. What do you find in the corner between the little slipper stub and the web? A. There is a fillet in the corner there.

Q. What is that fillet used for? A. It would not be good practice to make a sharp corner there, in the first place, and probably that is put there so that they can draw that out of the sand.

Q. How long have fillets been known to your knowledge? A. Ever since I have had any knowledge of engineering.

Q. Wasn't that about the first thing that was taught you when you had instructions in pattern making and molding? A. Yes.

Q. Now, what are the parts 11, Fig. 1 of the Anderson patent? A. They are ribs from the head to the wrist pin bosses.

Q. Now, what are the parts 13 of the Anderson patent, Fig. 2? A. Those are webs running parallel to the wrist pin boss, from the head to the wrist pin.

Q. How do the webs 13 of the Anderson patent compare with the webs 9 in Fig. 3 of the Jardine patent? A. I should say they were the same general design.

Q. What is the web 12 of the Anderson patent? A. It is a web across the head of the Anderson patent, parallel to the wrist pin boss.

Q. How does that web 12 compare to webs indicated by the 8 in Fig. 3 of the Jardine patent? A. They seem to go across the head in the Jardine patent much the same as the web 12 in the Anderson patent.

Q. In the Anderson patent, however, the slippers are not severed from the head, is that right? A. That is right.

Q. Illustrating the relation between the locomotive and the marine connections, I want to call your attention to German patent 176,988.

Mr. Richey: Is that in the answer?

Mr. Bruninga: No.

Mr. Richey: I object to it as not being set up in the answer.

The Master: Same ruling.

Mr. Bruninga: Mr. Richey, practically all of these, I don't think without any exception are in the answer in the Simmons case.

Mr. Richey: Then you have known about them for a long time before the answers were filed in this case and you haven't given us any notice of them?

Mr. Bruninga: Oh, sure. Sure; I had no idea you were going to use an ordinary slipper piston as infringing any of the patents in suit, or an ordinary T-slot as infringing all of the patents in suit, and even the straight slot with an L, as infringing all of the patents in suit. I thought it would be limited to what the patents disclosed and claimed, together with the specifications, read together, instead of covering things that have been in use and in patents and publications for 20 years.

Mr. Richey: I move that statement be stricken out as argumentative.

Mr. Bruninga: I am perfectly willing to have both of them stricken.

Mr. Richey: No, I want mine left in.

The Master: Leave both of them in.

Mr. Richey: May I reply to this statement he made?

The Master: Yes.

Mr. Richey: Counsel has known for some time of the attitude of the plaintiff about the patents in suit; he has known about the suits here against the Simmons Company and the Lawrence-Ohio Company. His clients have been advised of their infringing actions whenever they have come to the notice of the plaintiffs. Although he has known for at least two weeks that the plaintiff charged that the specific devices now charged to infringe were charged to infringe, these devices were injected into the case by defendants' counsel, he has not notified us of his intention to rely upon anything not set

up in the answer. We at the present time deny that the subject matter of any of the patents in suit is old, and at the proper time we will reply to that challenge specifically. All I care to leave in there is the fact that you have known of these things a long time and haven't told us anything about them. That is all I care. You may leave the balance of it out if you want to.

(Previous question read.)

Q. Can you read the drawings of that German patent structure? A. Yes, sir.

Q. Can you read it and even without any description tell what the structure is? A. Yes.

Q. Now, compare the piston construction in the German patent 176,988 with that of the White patent 1,195,936 as far as connections between the cross-head or the piston and the connecting rods are concerned?

Mr. Richey: Objected to as immaterial.

The Master: Same ruling.

Mr. Richey: There is no issue here between these patents. The issues are validity and infringement.

A. The German patent shows the type of cross-head connection for a marine type of connecting rod, where the connecting portion of the rod is split and goes each side of the wrist pin bearing in the cross-head. In the White patent the so-called locomotive type of connecting rod is shown, where the connecting rod goes beyond the two bearings and in the slipper or cross-head constructions.

Q. Now I notice there is a peculiar construction in the White patent with, first, the straight pin connection and then a roller connection; has that anything to do with the essential features of the piston construction as a piston construction?

Mr. Richey: Same objection; further as leading.

The Master: Same ruling.

A. No, sir.

Q. I call your attention to French patent to Serex, 434,147, and patent in addition to that patent, 16,362, also to Serex, together with translations which I have attached. Have you read the patents and the translations?

Mr. Bruninga: I may say in this connection I gave Mr. McCoy a copy of those patents and the translations yesterday. Those were recently discovered.

Mr. Richey: I make the same objection, that they have not been set up in the answer.

The Master: Same ruling.

A. I have read them.

Q. Will you take first the original patent 434,147, and briefly explain what you deem pertinent to this case? A. This is a sleeve valve or piston valve, in which a piston slides inside of the cylinder or valve casing. This valve as working by the ports seals the ports against the gases in the cylinder. The pertinent part of this valve is the section shown at 1, which is a T-slot portion of the sleeve and serves to expand against the cylinder wall to keep the valve tight across the ports.

Q. What does the Fig. 5 show? A. Fig. 5 is a section through this T-slot, this being the slot shown at n and o, is the free portion of the piston, showing the clearance enlarged.

Q. What does the inside annular show in Fig. 5, and what does the section outside show? A. The section outside shows the portion of the valve, and inside shows the portion of the sleeve, if it wasn't slotted, I should say.

Q. Well, can you tell whether they are pulled out or what? A. They are expanded out so as to have a springing action from this section to that.

Q. Now, continue with the next patent. A. This is much the same idea except that the T-slot is put at both the bottom and the top of the valve to hold the valve against the side of the cylinder wall.

Q. Now, I notice that in Fig. 6 the same reference letters n and o are used as in the original patent. Now, can you tell me what bearing Fig. 6 has upon the lower part of the structure, that is the piston d, if any? A. Well, it illustrates the operation of the T-slot in the lower part, being the same as the operation of the T-slot in the upper part.

Q. In other words, again, the spread-out part in Fig. 5, does that have any bearing on the lower part of the structure d? A. Yes, it shows the same action as this part, being sprung out from a circle, the inner circle, so that there is a pressure set up between the section "o" and the cylinder wall which tends to keep the valve

tight against the seat of the cylinder opposite the T-section.

Q. Well, can you illustrate that a little better, using piston Exhibit CCC? I don't want you to even say that they bear any resemblance, but as illustrating what you said was the T-slot at the lower end of the piston, in connection with Figs. 2 and 5 of the patent of addition, 16,362? A. In piston Exhibit CCC, this portion marked as "o" would be represented by the portion of the piston surface bearing the slot, the slot being represented by the space between these two portions marked as "o." If this was bent out or sprung out so that it moves from this point to there (indicating) then you would have a pressure against any cylinder wall, which would press out, and you would have to push it in, causing a springing action on these surfaces.

Q. What is the net result of that T-slot arrangement in the French patent, whether at the top of the piston valve "d" or at the bottom of the piston valve "d"? A. The net result is that it holds the piston against the cylinder walls, and therefore seals the piston against the gases passing up the walls.

Q. Now that piston "d" in neither case is the power piston, is it? A. No, sir.

Q. It is a piston valve, isn't it? A. That is right.

Q. But from the title, it says, "Slide valve with alternating movement for valveless engine," and what kind of an engine do you understand that valve to be for? A. I should say combustion engines, automotive engines.

Q. And can you tell me how close the valve, the piston valve, is to the cylinder of the engine? A. It is a common sliding piston.

Q. I mean is it alongside of it or far away from it? A. Right beside it.

Q. Will the valve barrel get hot, then? A. Yes.

Q. And is there any utility in that connection of providing a T-slot? A. Yes, it allows for expansion and contraction of the piston in the cylinder and of the valve.

Q. In what way does such connection compare, if at all, in providing a T-slot in a power piston of an engine? A. I should say the connection was very similar to the power piston of an engine as far as the fit between the valve and the cylinder or its casing is concerned.

Q. In connection with the Schmiedeknecht patent, I want to call your attention to the Fairy British patent 12,772 of 1914. Have you read that patent? A. Yes, sir.

Q. Just briefly describe the construction of that piston. A. This is what might be called a cross-head or an hour-glass type of piston, in which the wrist pin supporting member is made of a separate piece riveted into the piston proper, the inside member being the cross-head type and carrying the wrist pin.

Q. In what way do the webs 6 in Fig. 3 of the Fairy patent compare with the webs 21 of the Schmiedeknecht patent in Fig. 4? A. I should say that the web was essentially the same in the Fairy patent as in the Schmiedeknecht, that is, web 6 functions the same as the web 21 in the Schmiedeknecht patent.

Q. In other words in both cases they go across from skirt wall to skirt wall? A. That is right.

Q. But how about the wrist pin bosses 9 in Fig. 3 of the Fairy patent, how are they mounted? A. They are mounted on the web at one end only; they are not carried out to the skirt of the piston as in Schmiedeknecht.

Q. In other words, how does the mounting of the web in the Fairy patent compare with the mounting of the web on piston Exhibit 1? A. Same general idea in the patent as in the piston Exhibit 1.

Q. Why do you say that? A. Because the wrist pin boss, as shown in the patent, is mounted in the web at one end of the boss; and in the Exhibit 1 the wrist pin boss is mounted directly in the web, more nearly central to the boss, but the construction is practically the same in the two cases.

Q. Now, in what way is the wrist pin boss mounted in the Schmiedeknecht patent? A. The wrist pin boss is mounted at one end of the web extending across the skirt, and at the other end in the skirt of the piston directly.

Q. Are mountings, in which boss is mounted in the center of a web, and the construction in which a web is mounted or supported between its ends, the same? A. I could not say they were the same, no.

Q. In other words, compare the three, Plaintiffs' Exhibit 1, the Fairy patent and the Schmiedeknecht patent as to the mounting of this wrist pin boss; which are the most similar of the three? A. Plaintiffs' Exhibit 1 compares very much more nearly to the one shown in the Fairy patent than the one shown in the Schmiedeknecht patent.

Q. Have you read the Pugh British patent 17,256, of 1907? A. Yes.

Mr. Bruninga: Mr. Richey, that is also cited in the answer and cited by the Patent Office.

Mr. Richey: Cited against what patent in the answer?

Mr. Bruninga: The Schmiedeknecht patent.

Mr. Richey: And your inquiry is limited to that, to the Schmiedeknecht patent?

Mr. Bruninga: As to this construction; I wouldn't say so.

Mr. Richey: If the question is not limited to the Schmiedeknecht patent I object to it as not pleaded.

The Master: Well, when the question comes I will pass on it.

Mr. Richey: I have to object or my right is waived, that is the rule.

The Master: Very well.

Mr. Richey: Certain of these patents in the answer are cited against certain of the patents in suit. May it be understood, without my repeating the objections, if either counsel or the witness undertake to apply them to any other patent than those against which they are cited, it will be understood I object to that as not being properly pleaded?

Mr. Bruninga: Yes.

Mr. Richey: May it also be understood in case you produce any further patents or items that are not set up in the answer, that I object to them on the ground they are not set up in the answer, without my repeating the objection?

Mr. Bruninga: Yes, the record will show that anyway.

Q. Now, you have read that patent, have you? A. Yes.

Q. Now, the specification contains numerous figures. I wish you would limit your explanation to Figs. 3 and 4, the descriptive matter I believe is found at the bottom of page 3 of the specification. Will you just briefly explain that construction, and particularly the mounting of the wrist pin bearings, I will call them? A. This piston construction is essentially a built-up steel piston. Regarding the wrist pin bearing, it is shown at one end of the wrist pin as mounted from a web suspended, sprung from the head of the piston, and the other end of the wrist pin is mounted on the skirt wall.

Q. I want to call your particular attention to Fig. 4. You say suspended from the head. What does Fig. 4

show? A. Fig. 4 shows it is also sprung from the piston wall, that is, webs running to the piston wall support the wrist pin boss. Comparing this to the Schmiedeknecht patent, we seem to have the same construction in this piston, as far as the wrist pin boss supporting members are concerned, except that this support is sprung from the head as well as from the side walls of the piston.

Q. But you don't find holes punched in the side? A. No.

Q. In the Pugh patent, do you? A. No.

Q. And I believe you said that was the practice, to bore holes in pistons?

Mr. Richey: Objected to as leading.

Mr. Bruninga: I am asking him if he said so.

Mr. Richey: If he said so, no need to repeat it.

Q. Did you say so? A. Yes.

Mr. Richey: I object to it as leading and immaterial.

The Master: The question has been answered; go ahead.

Q. What have you to say to the Fairy patent with reference to any holes? A. The Fairy patent has a relief around the end of the wrist pin in the skirt of the piston, much the same as the Schmiedeknecht.

Q. Well, both of these constructions of the Pugh and the Fairy patent are built up structures. Will you look at Figs. 1 and 2 of the Fairy patent and tell me in your opinion whether that could be cast in a single piece? A. Yes, I think it could be cast in one piece, that is, the skirt, head, and cross-head section could be cast in one piece.

Q. Not the wrist pin, of course? A. No.

Q. What have you to say to that Pugh patent, Figs. 3 and 4, could that be cast in one? A. That could be cast in one piece as shown in those figures.

Q. Now, considering this Exhibit 1, and with the relief pushed in, why in your opinion do the wrist pin bosses extend outside of the relief, from a design standpoint? A. Well, it is good practice to design the wrist pin boss and have the support near the center of the boss to distribute the load, and also it is desirable of course to get the wrist pin bosses as far apart as possible, making the boss as long as can be.

Q. Now, in the design of any bearing, is any attention paid to the length of the bearing, compared to the

stresses that are encountered? A. Oh, yes, fundamentally, yes.

Q. Any rules of design on that? A. Well, it is desirable to keep the load on the bearing to within certain limits, and the bearing has to be proportioned in length and diameter to the load it carries.

Q. Would it be, then, the proper practice from a pure matter of design, where the relief is pushed in, to cut off that bearing on the outside so as to be even with the piston?

Mr. Richey: Objected to as leading.

A. I couldn't say the bearing would be long enough to bear the load under those conditions.

Q. Considering now the Mooers patent 1,402,309, in connection with the Franquist patent, what happens upon expansion of the piston under heat? I have particular reference now to the Franquist patent and comparing that with the Mooers patent, assuming, for instance, that the line of connectors 3 at right-angle to the wrist pin bosses, are omitted? A. The action of the Franquist patent under heat, as I understand it, is that the piston expands on a line parallel to the center line of the wrist pin, and that expansion tends to pull in the side of the piston perpendicular to this line. This can take place because of the fact that the skirt portions of the piston between the vertical slots are cut away from the head above the slipper side of the piston.

Q. Can you illustrate that in connection with piston 3-Q? A. This piston of course expands in all directions or diameters, but when it expands in the line parallel to the wrist pin, which it can do because of the relief on this side of the piston, it has a tendency to pull this side of the piston in, and this side of the piston in, indicating on the sample.

Q. Indicating the parts that are cut away from the head.

The Master: The thrust faces?

The Witness: The thrust faces, yes. Because of the fact that this slot makes this part of the piston flexible to a certain extent, and because of the fact that this slot, the horizontal slot above the slipper surfaces or thrust faces, cuts this portion of the piston from the head, so that as this expands out, these cave in and the whole piston becomes more or less elliptical in shape.

Q. Now, comparing that with the Mooers piston. A. If we get out these connectors on the side, in this view No. 2, shown as 3, because 3 refers to all the connectors, to this connector in view 1 and the one opposite, shown here and here.

Q. You were pointing to the central connector 3 in Fig. 1 and the two side connectors 3 in Fig. 2? A. That is right. You have a construction very similar to that obtained in the Franquist piston and an expansion along the center line of the wrist pin in this direction, in Fig. 1, tends to pull the side walls of the piston or the thrust faces of the piston in towards the center of the piston. Perhaps I can illustrate it better in this view. (Indicating Fig. 3). The expansion in this direction tends to pull these thrust faces and this side of the piston in towards the center and makes that elliptical. Of course this can happen in the Mooers because the head is cut away from the skirt, but the skirt is not made flexible by vertical slots, so that any distortion in this piston would simply have to distort the skirt as a shell and make the cylinder become oval in shape.

Q. Can you tell me whether that action which you have described, pulling those cylindrical portions of the thrust faces in, would be affected in any way by the presence of the connectors 3 on those thrust faces in the Mooers structure? A. I should say it would, yes.

Q. What way does that affect that pulling in? A. That would retard the pulling in at the top of the skirt, certainly, and might make it impossible to pull it in.

Q. Do you find any connectors between the piston head and the skirt on the thrust diameters of Exhibits 1, BBB, CCC and 3-J? A. Well, on Exhibit BBB we have the head cut away from the skirt on both the thrust faces, and this piston could expand and contract, as I have outlined, in the Franquist piston. I suppose the slot could be cut through in Exhibit 3-J.

Q. Yes, the slot is supposed to be cut through. A. And the head is cut away from the skirt on one side of that piston only, and therefore the condition would be slightly different, but the operation on the thrust side or the slotted side of the piston would be somewhat similar to that of the Franquist. In Exhibit CCC, we again have the head cut away from the skirt on both sides of the piston, and the operation, I should say, would be very similar to that of the Franquist. In Exhibit 1, here again we have the head cut away from the skirt on both thrust

faces of the piston, and I should say the operation might be very similar to that in the Franquist piston.

Q. Now, I notice in all of those four exhibits there is a slot only on one side, and limiting myself to Exhibits 1, BBB and CCC, the skirt is cut away by a circumferential slot from the head on the solid side. Will you describe any action as to that particular non-slotted side with reference to what you have said in the Franquist patent? A. The non-slotted side?

Q. Yes, the non-slotted side. In other words, you have referred to the pushing out, the diametrical expansion of the head carrying the skirt with it? A. Yes, that is the same action we have in the Franquist patent, namely, that this piston expands parallel to the wrist pin, and being cut away from the head can become elliptical, smaller on the thrust side, on the thrust faces, than on the faces parallel to the wrist pin.

Q. And permits the diametrical expansion of piston Exhibit CCC on the line of the wrist pin bosses? A. The piston is relieved on that side at the top of the skirt so that expansion can take place.

Q. And you said it was relieved in the Franquist patent all the way down? A. Yes. Of course it is different in that respect, in that at the bottom of the skirt this piston shown in Exhibit CCC is not relieved at the bottom of the skirt.

Q. But the skirt is split in that particlar construction? A. Yes, that compensates for it.

Q. Well, as far as the bottom part is concerned with that slit in it, in what way does the operation of Exhibit B distinguish from the operation of CCC, so far as the bottom of the skirt is concerned? A. They are both collapsible, both Exhibits B and CCC.

Q. Now, Dr. Jeffries I believe said that Franquist patent structure is stiff because the wrist pin is clamped in the piston. Am I right or wrong on that, Mr. Richey?

Mr. Richey: Yes.

Q. How is the wrist pin mounted in the piston of the Franquist patent 1,153,902; explain that to the Court. A. My idea is that this pin floats in the piston and is tight in the rod, that is, this portion of the rod clamps the pin, and these oil holes running down from below the lower ring tend to lubricate this bearing here and here (indicating) so that it can float in those bearings and be properly lubricated.

The Master: In the wrist pin bosses?

The Witness: Yes, in the wrist pin bosses of the side walls of the piston.

Q. Unless that wrist pin did float in those bosses, would it be necessary or would anybody even suggest the oil groove right to that bearing as indicated by the reference numeral 8? A. I cannot see any object of lubricating a tight joint.

Q. Now, in that respect how does the structure compare with the Gulick patent structure, for instance as shown in Fig. 2? A. Very similar, I should say.

Q. In the Gulick Fig. 2 you also have a boss underneath which might look like it received a screw, is that right? A. Yes.

Q. Now the patent specification states, at page 1, line 52, et seq., you can follow the drawings while I read the specification: "These bosses are provided with ribs 7, through which an oil groove or hole 8 is bored in order to supply the lubricating material to a crank pin 9, which is suitably fitted in journals provided and held in place therein by set screws 10. The pin 9 carries the connecting rod 11, the construction thus far described being typical of the ordinary hollow trunk piston." Now, when it states the crank pin 9 is suitable fitted in journals provided in the bosses, does that convey to your mind it is supposed to be tight? A. No, a journal must refer to a moving part. In this case there is an oscillatory or reciprocatory—not reciprocatory but oscillatory motion between the pin and the journals.

Q. When it says "fitted in journals provided in these bosses and held in place therein by set screws," what does that convey to your mind? A. This shaded portion here evidently is a journal fitted into this wrist pin boss, and this journal is held into the boss with that screw. Then the wrist pin goes inside the journal and floats inside it.

Q. Can you tell me whether or not it was the practice to bush bearings in pistons? A. Yes, when cast iron was used it was quite common, almost necessary to bush the bearings with bronze or brass.

Q. Now, I notice that the Gulick patent construction has the same general idea, that is, that the boss at the lower end of the wrist pin bosses is arranged to receive a set screw, isn't it? A. Yes.

Q. And these bearings are much larger than necessary, isn't that right? A. I should say they were.

Q. What is your idea as to what Gulick intended? A. I should say the idea of putting a journal in those bosses and using these set screws shown here, or the bosses for the set screws shown, to hold that journal in the piston; then the wrist pin oscillates in the journal itself.

Q. Is it your idea any bosses would have been provided at the bottom of these wrist pin bosses unless set screws were to be used? A. I cannot see why there would be, as long as he has oil ducts from the outside of the piston surface to these journals.

Q. Is it your idea those bosses are put on there in order to provide a straight surface to take the drill? A. Why, no.

Q. Why do you say that? A. Why, you can drill that without having any bosses there, and it is done very often by jig drilling.

Q. Now, what kind of mountings were used in pistons in 1914, what kind of wrist pin mountings? A. Why, the wrist pins were mounted to float in the piston journals or to float in the upper end of the connecting rod, usually, however, I would say they clamped in the connecting rod and floated in the piston, in those days. Here is another thing I might point out, and that is these set screws which hold the journals are put in there so that this oil hole, when drilled down through the journal, will always be held in line with the oil holes drilled in the piston.

Q. You have reference to the Gulick patent? A. Yes.

Q. What do you say now as to the Franquist patent in that connection? A. The same thing would apply in this piston, that is, you have got to hold the journal in the piston so that this oil hole in the journal will line up with that in the piston.

Q. Now, with reference to the Spillman & Mooers patent, which is acknowledged in the Mooers patent, Spillman & Mooers 1,092,870, and having reference to the Mooers patent 1,402,309, I want in this connection to use the model Exhibit EEE for illustration. That structure practically has to be cast in a sand mold, doesn't it? A. As shown, yes.

Q. And that is due to the fact there is a space between the connectors and the skirt? A. That is right, cord space.

Q. And the connection from the head is made to the lower part of the skirt? A. Yes, sir.

Q. Is there any change in that connection as distinguished from the Mooers structure? What I want to have you point out is any possible result of Spillman & Mooers to Mooers, and any compromise which would have to be made? A. Why, it is perfectly evident to me, that this piston, being the first one in the art—

Q. You mean the Spillman & Mooers piston? A. Yes. —was found difficult to make, manufacture, and Mr. Mooers tried to get away from the difficulty in this Spillman & Mooers patent, in his new construction shown in the Mooers patent, 1,402,309. His idea was that if he took this support for the skirt and moved it up to the top of the piston, putting it over against the side of the piston walls, as shown in the Mooers patent, he would get a piston which would be much more easily cast and of lighter construction. Is that what you had in mind?

Q. Yes. Did Mooers get as efficient a construction? A. I should say he spoiled the piston from an operative point of view.

Q. Is that a manufacturing question or a structure question that Mooers was faced with? A. Why, it was a manufacturing question, evidently.

Q. Now, will you compare Exhibit 1 with the Spillman & Mooers structure, using the two models, Exhibit EEE and 3-G, and point out any similarities? A. The construction shown in 3-G is similar to that of the Spillman & Mooers, in that the wrist pin boss is supported by a web which comes down from the head of the piston, although the web in the 3-G is sprung from the ring flange. However, I don't think that would be a material difference. The difference between the two is that Mooers or Spillman & Mooers shows his connection from the head to the bottom of the skirt, while the Exhibit 3-G shows the connection connecting the piston walls about near the top of the skirt.

Q. What have you to say about comparative efficiency of those two pistons? A. I should say that the Spillman & Mooers was the better design because of the fact that the heat is carried to the top of the skirt and distributed throughout the skirt, while in this design (indicating 3-G) the heat is carried directly to the top of the skirt where the expansion is greatest and where the flexibility is least.

Q. But the Exhibit 1, illustrated by model 3-G, is easier to cast, is that right? A. Yes.

Q. It can be cast in a permanent mold? A. It can be cast in a permanent mold, where Exhibit 3-E would be difficult to cast in a permanent mold.

(Short recess taken.)

Q. Now, briefly compare the Chenard and the Walcker patent structure with the Ray Day type piston, Exhibit 8, and state what difference you find between them? A. The first and most obvious difference is that the piston in Plaintiffs' Exhibit 8 is not split on the thrust side or the side opposite the thrust in the piston, as in the Chenard and Walcker patent. The ribbing on the inside of the piston is somewhat different than in the Chenard and Walcker patent, but the function of the piston, that is the flexibility of the piston, not taking into account the vertical slot, would be about the same as that shown in the patent. The piston is suspended by ribs springing from the head and going to the wrist pin bosses.

Q. Compare Exhibit 8 and the Chenard and Walcker patent and the Mooers patent in suit with reference to the connection from the head to the skirt; which two approach each other more closely? A. I should say the Chenard and Walcker patent was very much more like Plaintiffs' Exhibit 8 than it is like the Mooers patent, in that in the Mooers patent the connectors go directly from the head to the top of the skirt, while in the piston, Exhibit 8, the connectors go from the head to the wrist pin boss, as in the Chenard and Walcker patent.

Q. Which of the patents that you have discussed approaches most closely to the Mooers patent structure, assuming that the connectors at right angles to the wrist pin bosses are omitted? A. The Franquist patent, I should say.

Q. I believe you have discussed the Schmiedeknecht patent and the relation of the defendants' piston, the Ferry and the Pugh patents and the Spillman & Mooers patent. What do you consider the closest prior patent to the Schmiedeknecht patent, considering the feature of suspending or mounting the wrist pin boss between a web connected to the skirt and the head? A. This English patent 17,256 to Pugh.

Q. English patent to Pugh, 17256 of 1907? A. That is the one that seems to be the closest approach to the Schmiedeknecht patent 1,256,265 of any we have discussed.

Q. Now, taking up the Maynard patent, and in taking up this patent I want to call your attention to the Schmiedeknecht patent, and particularly the oil groove 13 with its oil holes 15, the specification of the Maynard patent states at page 1, line 12: "To avoid sticking or freezing of this skirt due to expansion, certain constructions of pistons have provided skirt with a longitudinal slot therein to compensate for expansion, but there is one serious difficulty with all of such constructions, viz, the tendency for the lubricating oil to work up beyond the skirt and rings and into the explosion chamber. This results in the formation of carbon and other difficulties incident thereto. With the present invention I have overcome this difficulty by arranging between the cylindrical ring portion and the skirt portion a continuous annular groove. This will receive the oil creeping past the skirt and permitting the same to drop back in the cylinder without providing any bridge for its passage to the ring portion." Now, as far as that statement is concerned, what have you to say with reference to the Schiedeknecht patent, which is a patent prior to the Maynard patent? A. In the Schmiedeknecht patent we have this oil groove cut circumferentially around the piston and holes drilled through from this oil groove into the interior of the piston, which gives practically the same result as the construction shown and described in the Maynard patent. That is, in the Maynard patent we have the groove going all around the lower ring and the channel at J which also gathers oil, and the oil can return to the inside of the piston because of the slots shown here, and this relief being cut into the slots.

Q. Now in what way do the functions of the slot E compare with the groove 13 of the Schmiedeknecht patent? A. As far as returning oil back into the piston, I should say the functions were the same.

Q. What have you to say about the slots in the Franquist patent in that connection? A. The slot in the Franquist patent is used to carry the lower ring but would function much the same, particularly if a slotted ring was used in the lower groove.

Q. Well, what is the action if there is a ring in the piston groove during the reciprocation? A. Oil works back into the ring and in this case the piston back of the ring is cut away so that the oil can work to the inside of the piston.

Q. The rings are slotted, are they not? A. Yes, that is customary to use a slotted ring to keep the oil consumption down.

Q. Now, considering the Maynard patent in the light of Exhibits BBB and CCC and 3-J, as not contemplating any specific construction as shown there, and keeping that in mind, what does Exhibit CCC represent with reference to the prior patents that you have discussed, in particular a trunk piston in connection with something else? A. This is a trunk piston with the head separated from the skirt, with a longitudinal slot, and the same applies to BBB and Exhibit 3-J. That slot separating the head from the skirt in all three of these exhibits acts as a means of transferring the oil below the lowermost ring to the inside of the piston, much the same as the groove in the Schmiedeknecht patent, and also the groove in the Maynard patent, which we have just discussed.

Q. Now, compare the Maynard patent structure and piston Exhibit CCC to the Monckmeier piston 3-V and 3-W, and state if you can which two of those three are most alike? A. I should say the Monckmeier piston shown in Exhibit 3-V compares and is quite similar to the piston shown in Exhibit CCC, and also to the Exhibit BBB.

Q. What have you to say when you compare the Maynard patent, the Schoengarth patent and those three exhibits? A. I should say the Schoengarth patent more nearly compares to Exhibits BBB and CCC.

Q. What have you to say as to the Long patent 1,395,441, particularly shown in Fig. 2? A. That compares more nearly to Exhibits BBB and CCC.

Q. How about 3-J? A. And 3-J.

Q. What have you to say as to the Spillman patent 1,325,176? A. That compares in general to the piston BBB, CCC and 3-J in that it has the slotted skirt and contains a T-slot.

Q. What have you to say if I substitute the British patent to Hives, 140,988? A. That compares more nearly to BBB, CCC and 3-J.

Q. Now, compare the Hives patent, in particular with 3-O, which is a piston in which the skirt is elliptical, with the minor axis or the shorter axis along the wrist pin bosses; what does that compare most closely with? A. That compares with this patent we were just discussing, in that it has the T-slot on the thrust side of the skirt, which is the major feature of this Hives patent.

Q. Now, considering the Maynard patent and the Schmiedeknecht patent together with the numerous T-slots which are shown in patents all the way from 1917 to 1920, and also in the Monckmeier piston, what have you to say as to the Maynard patent structure, assuming that Schmiedeknecht and these prior structures were known to Mr. Maynard, which the law presumes they were? A. Why, it is evident to me that Mr. Maynard, having these T-slots, and the Schmiedeknecht patent, and so forth, before him, designed his piston with those things in view, putting in the T-slot in addition, and he accomplished about the same results that the others had accomplished.

Q. Where is the only place that Mr. Maynard could put a T-slot in the Schmiedeknecht patent structure? A. In the skirt opposite the thrust side would be the logical place, running from the horizontal slot to the bottom of the skirt.

Q. Where would the circumferential part of the T naturally be put on the Schmiedeknecht patent structure? A. The circumferential part would be put at the top of the skirt below the lower ring land.

Q. Where would the vertical be put, for instance with reference to the reference numeral 15 as shown on Fig. 15? A. It would start at that point and run to the bottom of the skirt, practically vertically, so as to divide the thrust faces on the slipper portion of the skirt in two halves.

Q. Will you explain the action of a piston such as shown in the Maynard patent, in which there are no reliefs shown, in the drawing Fig. 1, with the action of a piston such as Exhibit 1? I hand you a diagram, and you might say if you have examined that diagram? A. Yes, I have examined the diagram.

Q. And put reference numerals on in making the illustration. First, tell the Court where that view is taken of Exhibit 1. A. The view is taken just below the slot, a section of the slot through the piston, in its vertical direction, just below this open slot. In this piston, or in all pistons, of course, we get an expansion on the diameter, and taking a radius point, in this sketch I have taken it at the edge of the relief, but if Mr. Bruninga wants to have it taken there, the same argument would apply.

Q. Take it where it is marked with the numeral A, for instance, where you said "there." A. At A. We

will have at least two forces due to expansion, taking place at this point. This one force will be on the diameter, through the center of the piston and extending out against the cylinder wall. This force would be represented by the vector, in this case B, and we have another force due to the expansion of the rib lengthwise, that rib growing in length, which we will represent by the vector C. Now, we will have a resultant force which we will call E, shown by the vector drawn between these two points and in the direction of the arrow on F. Then we will have, acting at this point or at this point—

Q. Acting at? A. At A.

Q. Or mark the other one G. A. G. We will have the force represented by the vector F in the direction shown, acting at the point A or the point G, which tends to push this portion of the piston out against the cylinder wall in this direction.

Q. You mean in the direction of the vector F? A. In the direction of the vector F. That has to be compensated for in some way in order to make the piston work. If it wasn't, and that force was exerted in this direction, the piston would burn.

Q. You mean in the direction of the vector F? A. In the direction of the vector F, it would burn or score, so that the action we get in this piston, Exhibit 1, is that this short web, the portion of the web from the point shown as A to the point G has to flex and allow the piston to leave the cylinder wall to a certain extent, or reduce the force acting at A or G by the amount of the flexure.

Q. Do the webs, if we can call the parts H webs, actually flex them at the top in Exhibit 1? A. No, these webs from this point represented by A, are integral with the head, so that there is no flexure of the web from this point back at the top of the web, as I see it.

Q. Now, explain any pushing out action along the wrist pin axis in Exhibit 1, and compare it with the Franquist patent, using in that connection the model, if you want to, Exhibit 3-G? A. Of course in that action we get an expansion along the wrist pin boss and in the direction of the wrist pin, which would tend to push the skirt, or portions of the skirt, out. This has been compensated for in this piston by the vertical slots, and that force is somewhat taken care of, although these ribs being as stiff as I have shown and as short, make that force rather difficult to compensate for in this design, more so I should say, than in the Franquist patent.

Q. Now, does the slot actually close as illustrated for instance in the diagram which you have referred to and which I will mark for identification Defendants' Exhibit 4-A? A. Why, as a matter of fact I think that what we get in this, and I believe practice bears us out, is that this portion of the skirt actually bends down towards the center of the piston in the direction of the arrow I. In that bending down, that relieves the pressure along the surface and we will get less friction due to the bending of this web or this skirt toward the center of the piston, but the slot does not close particularly.

Q. Well, will you get that action if you don't have any relief at all, as indicated from A to G in 4-A? A. No.

Q. Well, will you get any appreciable action?

Mr. Richey: I object to that as leading and trying to get the witness to contradict his other answer.

A. I don't think I would contradict it, Mr. Richey, necessarily in saying if this relief was not here these forces would be applied directly over the end of the rib so that they would get very little flexure of this skirt toward the center of the piston. It is perfectly evident to me that they put that relief in the piston because they had very heavy bearing over the end of the rib, and that is the reason why the piston was scoring and the piston didn't work satisfactorily at all without it.

Q. Now, in discussing the Franquist patent and referring to the fact that when the piston expands along the lines of the wrist pin then there is a contraction at right angles, is that your theory or do you have anything to substantiate that? A. Oh, no, that is a generally known fact in piston construction.

Q. Have you ever made a piston that took advantage of that? A. Yes, we made an oval piston of that design in the Franklin in 1922.

Q. Was that split up and down? A. No, not all the way, part way up the skirt.

Q. Part way, you mean from the top down? A. Part way from the bottom toward the top.

Q. Part way from the bottom toward the top? A. Yes. I don't know whether we have a piston here that shows that or not. Yes, like Exhibit B to some extent.

Q. In other words, as far as the top is concerned it was solid, is that right? A. Yes. We depended on the oval of the piston; it was solid except it was cut away,

in the slot, between the head and the skirt, on the thrust side.

Q. Do you consider a piston constructed as Exhibit 1, suitable for a Franklin engine? A. No, sir, I wouldn't say it was. I wouldn't consider it was flexible enough for practical operation in the Franklin engine.

Q. But you did use the Long piston as you have testified? A. Yes.

Q. Why was the Long piston used and suitable and why would not in your opinion Exhibit 1 be suitable for that Franklin engine? A. Because, referring particularly to the top of the skirt, the Long piston is very much more flexible at the top of the skirt than the Maynard piston and ill operate because of this added flexibility, where the Maynard piston would not, in the Franklin engine.

Q. Do you consider pistons like Exhibit 1 but with no relief in the thrust faces, practical? A. I wouldn't call it practical.

Q. But Exhibit 1 has those reliefs? A. Yes.

Q. Of all of the patents that you have referred to as against this Maynard patent, which do you consider the most pertinent, considering the Maynard patent structure as addressed to a piston without relief opposite the wrist pin bosses, and separated from the head by two quarter circumferential slots, and split, having particular reference as an example to Exhibit CCC? A. You want to compare the Maynard piston?

Q. Which of the prior art, and if there is a group, why, you can so state, do you consider closest to Exhibit CCC? A. I would say the Franquist piston was closest to Exhibit CCC.

Q. But let's consider it as having a definite T-slot? A. Of course the Franquist piston has not a T-slot, if that is what you want.

Q. How about these various T-slot patents and the Monckmeier construction, considering it as a T-slot piston, now? A. This patent 1,174,092, the Schoengarth patent, would to my mind represent Exhibit CCC as closely as any. Also the Long patent 1,395,441, and Long patent 1,489,499.

Q. I am talking about the T-slot now? A. That has no T-slot.

Q. How about the Hives patent 140,899? A. That incorporates a T-slot as shown in this Exhibit CCC.

Q. Now, considering practically the exact structure shown in the Maynard patent, do you find any single pat-

ent or prior art before you that shows that exact structure? A. No, not that exact structure.

Q. How about the Schmiedeknecht patent, what does that lack? A. That lacks a slot.

Q. A T-slot, you mean? A. Yes.

Q. Now, considering the Jardine patent and considering it as a slipper piston, what patent that you have previously referred to does it most closely resemble? A. Well, it has some of the elements of the Ebbs patent, for one, 700,309; it has resemblance to the Long patent 1,872,772; it has resemblance to Schoengarth patent 1,174,092 because of the T-slot as shown.

Q. I am just considering it as a slipper piston, now, not as a trunk piston. A. And it has decided resemblance to the Ricardo patent 1,294,833. It also resembles particularly the piston shown in the Anderson patent 1,283,021.

Q. Now, as a slipper piston, how does it distinguish from the Ricardo patent? A. Why, aside from the slotting and with the natural dimensions shown, I should say it was very similar, practically the same design, with a somewhat different arrangement of the webs where the webs join the head.

Q. How about the Anderson patent in the arrangement of the webs? A. It is very similar to the Anderson patent. The Jardine patent is very similar to the Anderson patent as to the webs.

Q. Considering the Jardine patent structure now as a trunk piston, what prior art structures do you think it resembles? A. All prior art structures that have the T-slot would represent the Jardine piston.

Q. How with reference to the relief? A. And of course a slipper piston is relieved on the side, as practically all pistons have to be in some manner or other.

Q. Now, what is your understanding of the webs 25 of the Jardine patent structure, are they rigid or flexible? A. Flexible.

Q. Even at the top? A. Yes, to a certain extent.

Q. What effect does the depth of the slot have, Fig. 6, for instance, on flexibility? A. The deeper the slot the more flexible the web.

Q. Would you consider Exhibit 1 as a flexible web, at the top? A. Not to the extent as shown in Jardine, if that is what you mean.

Q. Well, would you consider it as a flexible web at all?

Mr. Richey: I object to that. He has already answered.

A. No, I don't think. As I have already explained, except for the relief as shown on Exhibit 1, I don't think there is any flexure at the top of the skirt where the skirt joins the web.

Q. I think I asked that too broadly. When you said to any appreciable extent, did you mean in ten thousandths of an inch, or what? A. Yes, I mean in, I might express it as one ten thousandth of an inch, but I mean any appreciable extent which would allow it to work satisfactorily in an automobile engine.

Q. If the Jardine structure does not have flexible webs, what have you to say as to the action illustrated in that diagram, Exhibit 4-A, with no relief? A. The action would be very much the same as shown in the diagram and as explained.

Q. I mean with no relief from A to G, that is what you understood? A. Yes.

Q. Now, with reference to the Gulick patent 1,815,733, in what way does that distinguish from the Spillman and Mooers patent? A. In general structure? Q. Well, you can go ahead and give your explanation. A. The structure as shown in the Spillman and Mooers patent resembles the Gulick patent in that the skirt of the piston is suspended from ribs which spring from the head of the piston. In the Gulick patent, however, the difference is that the form of support or the web of the skirt passes from the center line of the wrist pin down practically, while in the Spillman and Mooers the point of support is somewhat nearer the lower end of the piston.

Q. In the Gulick patent the web structure goes all along the piston in Fig. 5, does it not, all along the skirt? A. Yes, although the point of support, I should say was from the bottom of this U-shaped curve in the web to the lower end of the web just below the lower portion of the U.

Q. By that you mean in Fig. 1? A. In Fig. 1.

Q. I was referring to Fig. 4. The web really goes all the way along that piston, doesn't it? A. Yes, as shown here, as being carried the full length of the skirt.

Q. Would you consider that the tiny connection above 19, Fig. 1 of the Gulick patent, is a web connection which will flex? A. I would say not, no, sir, not to any appreciable extent. Most of the flexure in this pis-

ton shown in this view appears at the narrowest point of the web, right at the bottom of the U.

Q. That is, assuming the web to be flexible; you assume that, do you? A. Yes.

Q. Now, the Spillman and Mooers patent of course does not have the split 21? A. No.

Q. Now, with reference to the Chenard and Walcker patent, in what way does that distinguish from the Gulick patent, outside of the split? A. The Chenard and Walcker patent shows a construction where the ribs extend to the wrist pin boss and the skirt is suspended from the outer end of the same wrist pin boss. In the Gulick patent that construction is, I would say, considerably different.

Q. But I believe you said that the Chenard and Walcker connection in that respect was the same as the Ray Day, is that right, Exhibit 8? A. Yes.

Q. Now, in the Ebbs patent structure, that is patent 700,309, in what way does that distinguish from the Gulick patent? A. In that the skirt of the piston is hung on the cross-head and does not resemble the Gulick piston, as I see, in any particular way.

Q. Well, how about the connection of the head with the skirt? A. It does resemble it in that way, that is, the head is separate from the skirt in both patents.

Q. How about the skirt being split, whether or not it is split? A. They are split in the Ebbs patent and also in the Gulick patent.

Q. Now, you referred yesterday to locomotive and marine connections, and you have discussed a German patent, 176,988, and the White patent 1,195,936, as showing the distinction between a marine connection and the locomotive connection, and yesterday you referred to the Roots patent 19,569 as showing a locomotive connection of a pitman? A. Yes.

Q. I hand you a photostat on which there is superimposed on the Ebbs patent the locomotive connection of the Roots patent, which photostat I will mark for identification Defendants' Exhibit 4-B. What is the pertinency of that or what does that convey to your mind? A. This shows the locomotive construction in the Ebbs patent, the Ebbs patent showing essentially a marine type of construction, as referred to the locomotive type as shown in 4-B.

Q. Where does the part represented by B and the wrist pin and its coupling to the cross-head, come from

in the Roots patent, what figure? A. It comes from Fig. 3.

Q. Can you tell me from the other views, for instance, Fig. 2, how the wrist pin is mounted in the crosshead in the Roots patent? A. It is held in by what we call a locomotive type of construction, where the bearings are on the outside of the rods.

Q. Well, what did the parts F and B refer to, I mean what are the parts on the opposite side of G, Fig. 4, these two parts? A. Those are the bearings.

Q. Where are they indicated in Fig. 3? A. There and there (indicating).

Q. To the right and left of the connecting rod B, is that right? A. Yes.

Mr. Bruninga: Your Honor, I offer in evidence as Defendants' Exhibit 4-C a decision of the Law Examiner of the United States Patent Office, dated April 4, 1924, in interference No. 49,569, involving the application of the Gulick patent in suit. Also as Defendants' Exhibit 4-D a decision of the Law Examiner on the same day in the interference 49,574, also involving the Gulick application of the patent in suit.

As Defendants' Exhibit 4-E a decision of the Law Examiner in interference 49,580, again dated the same day, April 4, 1924, and again involving the application of the Gulick patent in suit.

As 4-F, a decision of the First Assistant Commissioner, dated April 7, 1925, in interference 49,575, involving the application of the Gulick patent in suit.

Q. Now, Mr. Stellman, in Exhibit 4-C the Law Examiner stated: "It is common to make pistons of cast metal"; do you agree with him as to the date way back of 1917? A. Yes, sir.

Q. The Law Examiner further says that the French patent (having reference to the Chenard and Walcker 468,595) and the Spillman patent (having reference to 1,092,870) show all that is claimed except the longitudinal slot which is found in Ebbs and can accommodate circumferential thermal expansion. Do you agree with the Examiner in that, in that the slots in the Ebbs patent structure can accommodate circumferential thermal expansion? A. Yes, I should say they could.

Q. In Exhibit 4-D, the Law Examiner said: "The patent to Ebbs discloses all the elements of the count except a pair of wrist pin bearings depended from the

piston end and free from engagement with the skirt. It seems to be immaterial from a patentable standpoint whether the cross-head has one relatively long bearing or two short bearings for the connecting rod wrist pins and the cross-head bearing is free from engagement with the parts of the skirt opposite to the ends of the bearing. The patent to Ebbs alone is a substantial anticipation of the count." Do you agree with the Law Examiner that it is immaterial whether a cross-head has one relatively long bearing or two short bearings for the connecting rod wrist pin? A: Yes, so far as the operation of the piston is concerned.

Q. I believe you said that was the difference between the marine and locomotive practice? A. Yes.

Q. And in Exhibit 4-E the Law Examiner says with reference to the Spillman and Moders patent 1,092,870: "The pin bosses in the patent are obviously integrally connected to the head and to the lower part of the skirt, the latter connection at a point remote from the head being designed by the patentee to avoid as much as possible the transmission of heat from the hot piston head to the skirt." Do you agree with the Law Examiner in that respect?

Mr. Richey: Objection to that as leading.

Q. Do you agree or disagree with him?

Mr. Richey: Object to it as leading.

The Master: Same ruling.

A. I agree with him.

Q. He further says: "The natural and obvious reason would be to reinforce or strengthen the connection between the pin bosses and the skirt. This is accomplished in the Gulick piston by elongating the attachment of the rib to the skirt at points adjacent to the skirt, but any form of integral connection from the piston boss to the upper part of the skirt as well as to the lower part would be covered by the count. The point for decision is therefore reduced to the simple proposition: Is it patentable to connect the pin boss to the upper part of the skirt for any ordinary purpose, such as to reinforce the support of the skirt? If it should be found that the support of the skirt by connection to its lower part is insufficient, it seems clear that no more than common mechanical skill would be required to correct the defect and supply the remedy by additional connections or braces between the upper part of the skirt and the pin

boss. It is true the advantage sought by the patentee would be lost in part but an adequate support for the skirt would be just as necessary as the avoidance of undue heating and the loss in one respect would offset the gain in the other." What have you to say as to the Examiner's position from an engineering standpoint, not from a legal standpoint, now? A. I think he has taken a reasonable position there, namely, that the location of the rib inside, the point of support of the location of the rib, is not of great consequence.

The Master: We will take a recess to 1:30.

(Noon recess.)

(Thereupon at 1:30 p. m., the hearing was resumed.)

Q. In Exhibit 4-F the commissioner said, with reference to the Spillman & Mooers patent 1,092,870: "The Spillman & Mooers patent which was regarded as capable of modification in accordance with the Ebbs patent and in order to anticipate the count of interference No. 49,574, does not disclose flanges connecting with the skirt on both sides, but the connecting member is in the form of oppositely apertured cylindrical portion having a flared, more or less or disk-shaped bottom, which is connected to the skirt below the bosses. The functional limitation at the end of the count implies a yielding in the connecting flanges, as otherwise a skirt with a single slit would not be freely expansible and contractible. The disk-shaped connector of Spillman & Mooers would have a stiffening or trussing effect on the skirt so that even if slotted, as suggested in the count, the skirt would be substantially unyielding." Is it your opinion, having the proportions of the Spillman & Mooers patent 1,092,870, that if the structure were slit as in Exhibit 3-P that the bottom of the skirt would be unyielding, and in this connection you might consider any influence that the wrist pin has on that structure. A. While the wrist pin is comparatively tight in this piston as shown in Exhibit 3-P and for that reason would tend to limit the yielding of the piston skirt, it is possible to make this piston skirt flex with the hands, and I should therefore say that the piston skirt was very flexible.

Q. Do you agree with the commissioner then, that the structure of the Spillman & Mooers patent is such that even if slotted, the skirt would be substantially unyielding? A. I should say not. I should say he was wrong.

Q. Now you have considered the Gulick patent structure and leaving out of consideration any flexible webs but a structure in which the skirt will yield or in which any part of the skirt will yield, and considering the Gulick patent structure and Franquist patent and Defendants' Exhibits CCC, BBB, and 3-J, which two resemble each other the closer? A. I should say that Exhibits 3-J, BBB and CCC more resemble the Franquist structure than the Gulick.

Q. What would you say as to Exhibit 1, considering the inside part as a pushed-in relief? A. Exhibit 1 resembles Exhibits CCC, BBB and 3-J with the side walls of the piston brought out so that the relief was only partial.

Q. Now, consider the Franquist patent, the Monckmeier pistons 3-V and 3-W and taking again defendants' piston and the Gulick patent structure? A. The Monckmeier piston, Exhibit 3-V resembles CCC, BBB and 3-J.

Q. How about Exhibit 1? A. Exhibit 1, the Monckmeier construction would resemble Exhibit 1 with the skirts brought out so the relief was moderate.

Q. Do Exhibits BBB, CCC and 3-J have any webs on the inside at all? A. Yes, each one of them has vertical webs between the wrist pin boss and the head of the piston.

Q. Does Exhibit 1 have any web which is flexible at the top? A. No, sir.

Q. Well, take the Schoengarth patent, leaving out the adjustment connection and consider that patent and Defendants' Exhibits BBB, CCC, and 3-J as a group, and the Gulick patent, and state where you find most resemblance between any of the two. A. It seems to me that this Schoengarth patent resembles more the Exhibits, CCC, BBB and 3-J to much greater extent than the Gulick exhibit.

Q. How about Exhibit 1? A. The same would apply to Exhibit 1, Exhibit 1 with the skirt brought out, with the relief brought out more nearly to the skirt, would resemble the Schoengarth patent more nearly than the Gulick.

Q. Now, considering now the Ray Day piston, Exhibits 8 or 9, do you find any inside webs in that corresponding to the webs of the Gulick patent, that is, not the webs going to the top of the head, but going to the skirt, such as 17 and 18? A. No, I don't find any webs from the wrist pin boss to the skirt as in the Gulick patent.

Q. What have you to say about the piston Exhibit 3-O, does that have any webs on the inside? A. None except in the head.

Q. None? A. None from the wrist pin bosses.

Q. None going from the wrist pin bosses directly to the skirt? A. No.

Q. When you said "similar," did you have in mind structure or mode of operation? A. Functioning.

Q. The functioning? A. The functioning would be more nearly similar.

Q. How about structure; what can you say as to that? When you say the word "similar," more similar, for instance, to one than to the other. A. When the structure refers to the webs, I would say that was more similar in this to the Schoengarth patent than to the Gulick.

Q. Now, considering the Gulick patent from the standpoint of a piston having wrist pin bosses and connected to the skirt and to the head, what prior art structure, what particular patents resemble Gulick most, in your opinion, of the ones which you have, if you can pick out one or two patents, whether or not they are split, that is, the arrangement, as for instance, shown in Exhibit 3-R? A. Chenard & Walcker is one which has somewhat the same arrangement, as far as between the head and the wrist pin bosses is concerned. The Ebbs patent, in so far as being a crosshead section supporting the piston skirt or slippers. The same would be true in the Anderson patent; in the Ricardo patent.

Q. The Ricardo patent is later; you need not consider that. A. And the Spillman & Mooers.

Q. You mean the Spillman & Mooers patent 1,092,870? A. That is right.

Q. Which do you consider the best one as illustrating most closely the Spillman & Mooers, the Chenard & Walcker or the Ebbs? A. Spillman & Mooers without the slotted skirt. I think all three of them read quite directly on that piston.

Q. Now, when you come to functioning, going back to 1917 or even back of 1915 with a filing date, what do you consider the most pertinent reference as far as functioning in a manner that Plaintiffs' Exhibit 1 is concerned? A. Back of 1915?

Q. Yes, in a filing date,—functioning as this piston, which do you consider the best and most pertinent, now a split proposition and not an unsplit one, actually showing a slitted proposition? A. Perhaps the Ebbs.

Q. How about the Franquist patent as far as functioning and mode of operation is concerned? A. I should not think the Franquist patent was so nearly the Gulick as some of the other pistons.

Q. I didn't ask you that. I thought you misunderstood me. I asked you which is the most near in function to Plaintiffs' Exhibit 1? A. I should say that the Franquist patent did function as Exhibit 1.

Q. Do you know E. G. Gunn? A. Yes.

Q. Did you know him in 1920? A. Yes.

Q. Who is he connected with? A. The Packard Company.

Q. In what capacity? A. As an engineer.

Q. Have you met him in meetings of the Society of Automotive Engineers? A. Yes.

Q. In the issue of Automotive Industries, of January 29, 1920, page 362, in an article written by Mr. Gunn, he says: "Pistons of the Long and Franquist patent are split to allow the piston to spring. They can for this reason be fitted more closely than the more conventional types." What is your opinion as to that? A. I should think he was right as of that date.

Q. Can you tell me what type piston is illustrated in Fig. 8 on page 363 of that article? A. That is the so-called Long type.

Q. Can you tell me what piston is illustrated in that figure? It has no number,—the left view at the left of the page on page 364? A. That is the so-called Franquist type.

Mr. Bruninga: I offer in evidence a photostatic copy of the three pages, 362, 363, and 364 as Defendants' Exhibit 4-G.

Mr. Richey: We object to it as incompetent and immaterial, and not set up in the answer.

The Master: Same ruling. What date is that?

Mr. Bruninga: January 29, 1920.

Mr. Richey: So far as the facts contained therein are concerned, it is objected to as hearsay.

The Master: Same ruling.

Q. Do you know whether Mr. Gunn is still connected with the Packard Company? A. No, I don't.

Q. As you will note in Exhibit 1, there is this relief cut on each side in the thrust faces. Do you actually find any such relief illustrated in the Maynard patent, any relief cut into the face? A. No; I should say that there wasn't any relief shown in the Maynard patent

because it shows that the skirt comes out beyond the point of contact with the webs.

Q. Would it make a particle of difference with no relief whether that skirt itself with the webs behind it were inclined or were not inclined? A. I should say not.

Q. Did you ever meet Mr. Jardine? A. Frank Jarline?

Q. Yes. A. Yes, sir.

Q. Did he offer you any aluminum pistons? A. Oh, yes. Mr. Jardine has offered us pistons from time to time, I think.

Q. What indicates the relief in Exhibit 4-A, between what two points? A. Between the points indicated by the letter A and the letter G.

Q. Who paid you for your services in St. Louis? A. You did.

Q. Were there any services outside of testifying in that case? A. No; unless you would call some service in connection with getting information for that testimony.

Q. Well, you spent a number of days, didn't you? A. Yes.

Q. What was your time spent on? A. Looking over the patents.

Q. These patents in suit? A. These patents in suit.

Q. And any of the prior art patents that we have now? A. Prior art patents, yes.

Q. I retained you in St. Louis, though, for this case, didn't I? A. Yes.

Q. Did I consult with you with reference to the prior art and your knowledge as to the art? A. Yes, sir.

Q. Outside of the fact testimony in the Long matter? A. Yes, sir.

Q. Did you render me any bill for the days you actually spent on testifying as a fact witness for Long? A. I don't think the bill took into account the fact testimony as much as it did the expert part.

Mr. Bruninga: Take the witness.

Cross Examination by Mr. Richey.

Q. In 1915 and 1916 I understand you were familiar with the pistons that were in use at that time, weren't you? A. More or less.

Q. You have a pretty good knowledge of all the pistons that had any substantial use at that time, didn't

you? A. I don't know as I could say all of them, but some wide knowledge in connection with pistons at that time.

Q. And during 1917 and '18 you learned still more of them? A. Yes, I should judge so.

Q. The Franklin Company had kept in touch with the patents issued on the automobile accessories they were interested in, didn't they? A. Yes, they had some one in their organization that kept in touch with it.

Q. And during the period there when they were trying to develop a piston, they kept in contact with the patents on pistons, didn't they? A. I don't think we paid so much attention to the patents while we were developing a piston as we did perhaps after the development had proved a success.

Q. Well, nevertheless, you kept in touch with the piston as an accessory, the same as you did with the other accessories, didn't you? A. Oh, yes, we tried to be up to date in connection with piston design.

Q. Now, take this piston of the Hives British patent. How many patents did you refer to—you haven't got a list of them, have you?

Mr. Bruninga: I want to offer all these in evidence in one book and get them together. Mr. Richey can make his objections at that time.

The Master: Let them be offered as the next exhibit for the defendants.

Mr. Bruninga: I offer in evidence all of the copies of all of the patents referred to by me in this case as Defendants' Exhibit 4-H.

Q. Take the piston shown in the Hives British patent 140,988: was that piston as shown in that patent ever used commercially, to your knowledge? A. The particular piston as shown, I don't know.

Q. You don't know whether it has been used commercially? A. No.

Mr. Bruninga: This is actually immaterial, whether any of these pistons have gone into use at all, and I want to make that point and make that an objection. Although commercial success is considered by some courts, even by a prior art device.

The Master: Well, the question has been answered.

Mr. Richey: Want to hear from me on that? Because I am going to ask a lot of questions along that line.

The Master: I think I should let the testimony in over your objection.

Mr. Bruninga: I think you should let it in, because there is a difference of view of the courts to what extent commercial success of the prior art structure will be considered; but I want to make an objection to all questions relating to the commercial success of any prior art structure.

The Master: That objection will be regarded as entered. You may go ahead with your examination and it will not be necessary to enter the objection again. So far as that is concerned, it will be considered as made to all questions along that line.

Q. Would your answer be the same with respect to the pistons shown in the Hartog patent 1,842,022? A. I never knew that that piston was actually used.

Q. How about the piston shown in the Anderson patent; would your answer be the same? A. Yes, sir.

Q. Would your answer be the same about the piston shown in the Ebbs patent? A. Yes, sir.

Q. Now, about the piston shown in the Franquist patent 1,153,902, would your answer be the same about that? A. I understand—

Q. I am asking you, of course, about your own knowledge. A. Well, this is my knowledge.

Q. You started out by saying you understood. A. Isn't that my knowledge?

Q. If that is your knowledge, all right. A. I understand that this piston has been used commercially, or a similar piston.

Q. And you know that of your own knowledge, or that is what you heard? A. I never saw it in actual operation, if that is what you mean.

Q. When did you learn it had been used commercially? A. Around 1920, I should say, thereabouts.

Q. Do you know whether or not the piston shown in the Long patent 1,395,441 was ever used commercially? A. No; to my knowledge I don't know that that one ever was used commercially.

Q. Do you know of your own knowledge that the piston shown in the Spillman & Mooers patent 1,092,870 was ever used commercially? A. That is this piston shown in Exhibit 3-P?

Q. No, the one shown in the patent. A. This piston without the slot?

Q. Will you answer with respect to the one shown in the patent, first? A. Yes, I understand that that has been used commercially.

Q. You don't know that of your own knowledge? A. I haven't seen it used.

Q. When did you learn that they were used? A. When I was with the Franklin Company, I should say around 1918, '19, '20, somewhere.

Q. It was during the period when the Franklin Company was trying to get a satisfactory piston for their engine, wasn't it? A. Yes. We have always tried to do that.

Q. I mean it was during the period when you were —well, what piston were you using at that time? A. I should say we were using the Long piston, Mr. Richey, if my memory serves me right.

Q. That was after 1919, wasn't it? A. Yes, in 1919 or '20, at least we were doing experimental work with the Long piston.

Q. Well, the use of this Spillman piston shown in the Spillman & Mooers patent was very limited if you didn't know about it up until then. A. I wouldn't say it was generally used.

Q. Used only by this company of Spillman's, wasn't it? A. Yes, and I think the Sterling Motors Company used it.

Q. And neither one of them lasted very long, did they? A. The pistons might have lasted quite a while.

Q. Well, I say the companies didn't last very long? A. I don't know, Mr. Richey, about that.

Q. Well, you know they soon went out of business? A. No, I don't. I know they went into the hands of a receiver.

Q. Take the piston shown in the Spillman patent 1,229,540: was that ever used commercially to your knowledge? A. No; I can't say that I know that that one was used commercially.

Q. Do you know which one of the two was used commercially; the one shown in Spillman & Mooers patent or the one shown in the Spillman patent? A. I understood the one shown in the Spillman & Mooers patent.

Q. But you don't know of your own knowledge which it was? A. I didn't see it.

Q. You don't know whether the piston you heard was used was exactly like either one of them? A. No, I don't.

Q. Do you know if the piston shown in the Vincent patent 1,279,184, was ever used commercially? A. I don't know whether it was.

Mr. Bruninga: I believe, your Honor, that this particular plaintiff is estopped to deny that, because suit was brought against Mr. Long in which it was stated that these pistons, including those of the Vincent patent, had gone into wide commercial use, and to ask this witness now and try to dispute that—

Mr. Richey: Of course your statement about that is not evidence. I don't know whether it is right or wrong. I don't dispute or deny it.

Mr. Bruninga: I will introduce the bill of complaint in that suit against Mr. Long, including the Spillman patent. I have it at the hotel.

Q. Vincent is the Col. Vincent who for a long time has been chief engineer of the Packard Motor Car Company, hasn't he? A. Yes, sir.

Mr. Bruninga: Did he say had no commercial success?

Mr. Richey: He said it had none that he knew of.

Mr. Bruninga: I take it my objection is overruled?

The Master: Yes.

Q. Take the pistons illustrated in the British Rainforth patent of 1912, 6826: were either one of those ever used commercially, to your knowledge? A. Not to my knowledge.

Q. The same question about the piston shown in the British patent to Pugh, 17,256? A. I don't know if that was used commercially.

Q. The same question about the piston shown in the British patent to Ferry, 12,772? A. I don't know that that was used commercially.

Q. Same question about the pistons shown in the French patent to Chenard & Walcker, 468,595. A. No, I don't know if that was used, either.

Q. Would your answer be the same with respect to the Howe patent? A. No; I should say that had been used in, at least so far as the patent was concerned, in the making of pistons that has the oil groove.

Q. Who used it? A. Franklin used it for one.

Q. That is, with the oil groove in it? A. Yes.

Mr. Bruninga: I am wondering whether the witness really understands that question. Do you understand the question to be whether somebody was licensed under that particular patent or whether a structure like shown in the patent went into commercial use?

The Witness: Well, the Franklin Company was licensed under the Howe patent, I think.

Mr. Bruninga: I wanted to get that clear. What did you understand? Whether the patented structure illustrated in the patent, or whether somebody was licensed under the patent?

The Witness: I understood he asked if that construction shown in this patent was used by Franklin.

Mr. Bruninga: And you understood that about all the others?

The Witness: Yes.

Q. Take the Schoengarth patent: has that piston illustrated in that patent ever been used commercially to your knowledge? A. Not that particular type, no.

Q. This piston shown in the Spillman patent 1,325,176: was the piston shown in that patent ever used commercially to your knowledge? A. That is the Kantskore. I think it has been, yes, if that represents the Kantskore piston.

Q. Well, it failed, didn't it? A. No, no, that was fairly successful.

Q. It just busted the company, didn't it? A. I couldn't say.

Q. Well, you know they discontinued it and manufactured pistons substantially like Exhibit 1, don't you? A. Yes; but that might have been because one was a better piston than that; not because it failed.

Q. You think the piston Exhibit 1 is a better piston than the one shown in the Spillman patent 1,325,176? A. Piston 1 is not a very good piston, in my estimation.

Q. That is not the question I asked you. I asked you whether it was a better piston than the one shown in the Spillman patent. A. I wouldn't say that it was, no.

Q. Then you don't agree. You want to take back what you said about the Kantskore taking up the piston of Exhibit 1 after the Spillman? A. I don't know what the Kantskore was making until I heard you say it was or did. My familiarity with the Kantskore and the Aluminum Industries is rather meager.

Q. All you know about Kantskore using the Spillman piston is what you heard? A. I knew they used the Spillman piston, yes. But I don't know much about their success with Exhibit I.

Q. In your opinion, the piston shown in this Spillman patent 1,325,176 is a successful commercial piston? A. For replacement purposes I consider it rather successful.

Q. Would you say the sides would not collapse in use? A. Depends on how it was made.

Q. Well, made like shown in the patent. A. I understand they did have some trouble.

Q. Had a lot of trouble; you know that? A. I understand that.

Mr. Bruninga: May it please the court, I didn't know it was going to drag out so long, but here is the situation: some of the reports show the plaintiff in this case collected royalties on that particular piston, and a blue-print is shown attached to it, and it seems to me all this talk of having the witness try to show the piston is no good at all doesn't set very well. I object to it as not proper in this case on account of the position that plaintiff has taken.

Mr. Richey: Mr. McCoy tells me, that Mr. Bruninga's statement is incorrect; that royalties were not paid upon a piston like shown in this Spillman patent 1,325,176.

Mr. Bruninga: You dispute my word on that, do you, Mr. McCoy?

Mr. McCoy: The character of pistons on which royalties were paid over the period that has been testified to here was split only on one side. The thrust face of that piston was supported by internal ribs running circumferentially around the piston skirt, and it is my information that the Kantskore Company ceased to manufacture the Spillman type of piston about 1922—no, about 1920, I believe; some time around 1920.

Mr. Bruninga: I show then a report which has been produced by—

Mr. Richey: Are you going to argue the case now or go ahead with this witness?

Mr. Bruninga: I want to settle the matter, whether you can go ahead in that way. Report of June 30, 1927, which has been produced by the Cleveland Trust Company, a photostat of it which I have marked for identification Defendants' Exhibit

4-I, and which shows attached thereto clearly a piston of almost identically the same construction as shown in that Spillman patent; it is drawing No. 433.

Mr. McCoy: Your Honor, the drawing does not show—

Mr. Bruninga: Now, Mr. McCoy, you can call a witness if you want to on that, or you can go and take the witness stand yourself if you want to.

Q. Now, as a matter of fact, Mr. Stellman, you know that Kantskore Piston Company had a whole lot of trouble with this piston shown in this Spillman patent 1,325,176? A. No; as a matter of fact I don't know how much trouble they had.

Q. Now, let's look at this Long patent 1,489,499: was that piston ever used commercially, to your knowledge? A. No, sir.

Q. Was this piston shown in the White patent used commercially to your knowledge? A. No, sir.

Q. Was the construction shown in the French patent to Serex 434,147, ever used commercially to your knowledge? A. No, sir.

Q. The one shown in the Pomeroy patent 1,499,073: was that ever used commercially? A. Not that I know of.

Q. You know that Pomeroy is an internationally known automobile engineer, don't you? A. Yes, you can call him international: he is known in two countries anyway.

(Short recess taken.)

Q. Mr. Ricardo was also an internationally known automobile engineer, wasn't he? A. Yes, sir.

Q. Now, as I understand it, when you were working with the, first went to work with the Franklin Company, they were using an iron piston, is that right? A. That is right.

Q. Trunk type piston? A. Yes.

Q. And for an air-cooled engine? A. Yes.

Q. So the question of the heat was a greater problem with them than with the water-cooled engine; is that right? A. Yes, that is true.

Q. And what clearance did you use with the iron piston? A. As I remember, we used 3-5, 3 at the bottom of the skirt and 5 at the top.

Q. And the first aluminum piston you used was a trunk type piston? A. Yes.

Q. And when was that put in? A. That was put in about 1916.

Q. And what was the clearance? A. 8-11, as I remember it; 8 at the bottom and 11 at the top.

Q. And from then on, at least up until 1920, your effort was to secure an aluminum piston that would reduce that clearance; that is right, isn't it? A. That is right.

Q. And avoid the slapping, sticking, and scoring? A. Yes.

Q. Now, you also tried Magnalite pistons, didn't you, in that period? A. Those were the ones made by—

Q. What do you mean by Magnalite? A. I say is that the trade name of the Walker-Levett Company?

Q. Do you know whether it is or not? A. I am asking you if it is.

Q. Yes. A. We did use it.

Q. And you tried the Lynite piston? A. Yes.

Q. And you split the skirts of both the Magnalite and the Lynite up part way from the bottom, like in Exhibit B, did you? A. Yes.

Q. You also tried light weight cast iron pistons known as the Wainwright piston, didn't you? A. Yes; we tried some of those.

Q. You tried slipper type pistons, didn't you? A. I don't remember that we actually tried the slipper type like shown in the Jardine patent, for instance.

Q. Well, you tested out slipper type pistons with the idea that you might use them if successful? A. I don't think we ever tested that particular type of Jardine.

Q. I wasn't asking you about Jardine; I was asking you about what you call the slipper type piston. A. If you call the Long type a slipper type piston, we did.

Q. I am not saying yes or not how I classify the Long type piston. But didn't you try pistons generally like such shown in the Anderson patent, or in one of the other patents your counsel said disclosed the slipper?

Mr. Bruninga: Ricardo?

A. No, sir, we never tried that to my knowledge.

Q. Then you tried pistons with the slit part way up from the bottom, like Exhibit B, with the Stellman rings in them? A. I never heard them called that kind of ring; but we tried some that expanded along at the bottom.

Q. These rings you used to expand them out, such as shown in the Van Bever patent? A. That is right.

Q. Did you try a piston called the Zephyr piston? A. I think we did run some tests on a set of those.

Q. Did you try a short skirt Wainwright piston? A. I don't remember it by that designation.

Q. You tried several types of composite pistons in that period, didn't you? A. Yes, sir.

Q. Then you varied the thickness of the side walls, didn't you, of the piston? A. Yes.

Q. And you tried pistons that were tapered and pistons with straight skirts? A. Right.

Q. And pistons with off-set pin bosses? A. Yes, sir.

Q. Then you tried pistons made of various metals, including aceril, abc, macadam, and deltum? A. You are bringing back a lot of memories; I had forgotten all about those things.

Q. Well, you did try all of them? A. I think we did.

Q. And that was when you were chief engineer? A. I wouldn't say that; when I was employed by the Franklin Company.

Q. As an engineer? A. Yes.

Q. And any suggestion that you would make about improving the piston, I suppose, was considered and perhaps tried out? A. It might have been, yes.

Q. Did you try anything else to reduce this clearance and prevent slapping and scoring and sticking during that period? A. I think you have covered the ground rather thoroughly.

Q. I suppose you and the other engineers down there gave a good deal of thought to this solution? A. Yes, sir.

Q. The piston question when all those things came along? A. Yes, sir.

Q. And many schemes were submitted to you by people from the outside during that period? A. Yes, I would say some.

Q. And they were considered? A. Yes, sir.

Q. When was that slit ring put in the piston? A. As I remember it we never put that in the production piston. It was used by the service department of the Franklin Company for pistons already in service and for some pistons that they sent out from the factory to go into cars in service.

Q. That is, you are talking about the piston in the Van Bever patent now? A. With the slit ring.

Q. When was it first used in service? A. I would say the early part of 1917, around there some time; I can't tell you the correct date.

Q. How long was that used? A. Oh, it was used more or less until we used the Long piston.

Q. To your knowledge were other automobile companies than the Franklin during that period working on this problem of reducing the clearance with the aluminum piston? A. From the period 1915 on?

Q. To 1920, we will say? A. Yes, sir, they were.

Q. And how general was that problem being worked on at that time? A. Quite general, I should say. I know of one other company that used them more or less in that period.

Q. Those who were working on it would include the leading engineers of the leading automobile companies of the country, wouldn't they? A. Yes.

Q. I call your attention to Defendants' Exhibit H and to the figures there under the head "Well known types of pistons." What do those figures mean down there? A. That compares the general dimensions of the piston as outlined in the text between the so-called oval type piston and the Long type piston.

Q. What do you mean by the "oval" type and the "Long" type? A. The oval type was the piston something like Exhibit B, but ground so that a section taken through the wrist pin boss, for instance, would have an oval shape, the largest diameter of the oval being in the direction of thrust, the shortest diameter being parallel to the wrist pin.

Q. Did the Long type mean the one shown in this Long patent 1,872,772? A. Yes.

Q. That is, it was the type of Long piston that was used commercially by Franklin at that time? A. Yes.

Q. Referring to your drawing Exhibit 4-A and to the relief on the same at the edge of the connection between the thrust face and the webs, would you say a piston would be inoperative without that relief? A. I would say it would be very apt to score at the point at the end of the web.

Q. You don't say it would be inoperative? A. I don't say you couldn't operate it, no, under any conditions; but I say under severe conditions.

Q. You don't say the piston shown in the Maynard patent is inoperative? A. Not under any conditions; but under severe conditions.

Q. You look at Plaintiffs' Exhibit 21: that doesn't show any such relief as you mentioned, does it? A. I don't see any relief.

Q. Would you say that piston would be impracticable? A. Well, it all depends on what clearance you are going to run these pistons with, Mr. Richey.

Q. Well, at what clearance would you say this piston shown in Exhibit 21 would be an impracticable piston? A. In what motors?

Q. Well, what motor do you have in mind when you are talking about any piston being impracticable that didn't have relief, as you have shown in Exhibit 4-A? A. That which I had in mind was the average water-cooled motor, like the Ford.

Q. Let's take the average water-cooled motor like the Oakland: do you think that comes within your definition? A. Well, if this was a production Oakland motor; I don't know what motor that was; whether that was a production piston or an experimental piston; but I know what you mean if you don't say it.

Q. What I am asking you is: here is a piston,—you have said this piston shown in Exhibit 4-A would not be practicable unless you had that relief. I am asking you the same question about the one shown in Exhibit 21. A. I should rather see a section taken through that piston similar to the section like that, so that I could get an idea of the length of that web that was free there, before I made the statement.

Q. That is, you cannot express an opinion as to the practicability of the piston shown in 21, as shown in that drawing? A. No, sir.

Q. You haven't got enough drawing? A. I have got drawing enough, but I haven't the instruments and the ability to make a sketch showing how it would operate.

Q. What all would you like to have? A. As I say, I would like to have a section through that point just below the rib.

Q. What instruments would you like to have? A. A drawing-board and compass; I would like you to have a section made of that drawing at that point; then I could give you my opinion.

Q. You have three or four sections on there. A. There is not any section just at that point. That is why we made this section of that piston there, of Exhibit 1.

Q. Well, how many drawings do you have to have of a piston to tell whether it is practicable or not? A. Well now, is that necessary?

Q. Yes, that is necessary. A. I don't know how many; enough to get the information, that is all.

Q. Now, isn't it a matter of fact this drawing that I have shown you, Exhibit 21, is the kind of drawing that is submitted by the casting manufacturer to the motor manufacturer in connection with the sale of castings and from which the casting is machined? A. That is the detail of the piston, yes, to make a piston from. But I would not say that necessarily would furnish an engineer with enough information, with just what is on that drawing, to say whether that piston would work or not.

Q. If you had that drawing and the casting, would you know how to make the piston? A. Yes.

Q. And that is the kind of information that is furnished by the manufacturer of the casting to the motor car manufacturer with the castings, and from that the pistons are made; that is correct, isn't it? A. Yes.

Q. Now, you know very well the reason you are not answering that question is that you know that piston has been used commercially, don't you? A. No.

Q. You don't know that? A. No, sir.

Q. Now, I am going to ask you the same question about Exhibit 22, assuming that there was no relief, as shown at H, would such a piston be a practicable piston, even without that relief? A. Well, Mr. Bishop, you are asking for an opinion on a design which I say would require considerable consideration.

Q. Well, how long do you want to consider it? A. I don't want to consider it at all; but if you wanted to know my opinion, I would like to have you furnish a section through that piston similar to the section we have taken through Exhibit 1.

Q. That is, you have got a view here along the line B-B, haven't you, shown down here (indicating lower right hand corner)? A. Yes.

Q. And you have got the same thing over on Exhibit 21? A. Yes, but these are different.

Q. Now, how far below these sections would you want a section taken? A. Just to show this piston skirt.

Q. Just about— A. Just about ⅛" below.

Q. The only difference between the section B-B and the one you want is that the thrust faces would be shown in section instead of in elevation; isn't that right? A. No, that is not the only difference.

Q. And then it would be cut off on the boss? A. But if this piston did operate satisfactorily, why did they put that relief in there?

Q. That is not what I asked you.

Mr. Bruninga: Referring to Exhibit 22.

Q. You know they make improvements in these pistons; but my question was: without that relief would it be a practical piston, in your opinion? A. I should not think so, no.

Q. Now, can you answer the same question about the piston shown in Exhibit 21 you have answered about the other one, without the section you had to have? A. There again, the question of clearance enters, and they don't show on those drawings what clearance those pistons are supposed to operate with. I see they have a place for it there, but it is not on the drawing; perhaps they were afraid to put it on. We have got to have more information than that, if you are going to design a piston for any given motor.

Q. You would have to have the clearance given you before you can say whether any piston is practical or not? A. Yes; what clearances you want to operate with; what temperature you want; how much speed you are going to try to get out of the motor; and a lot of things.

Q. You couldn't tell how a piston operates without knowing the clearance? A. That would be one factor, I think.

Q. That is not the question. (Question read.) A. That is one factor.

Q. Well, you would have to have the clearance? A. Yes.

Q. Now, let's assume, suppose the clearance at which the piston shown in Exhibit 21 was operated was .001" per inch. You understand what I mean by that? A. Yes. Then it would be a practical piston. I should say that would be a pretty stiff piston to operate at .001".

Q. Even so, it would be practical? A. No, I don't think it would.

Q. You think it would be too stiff to be practical? A. I am talking about operating under severe operating conditions.

Q. I am talking about general run of mine commercial conditions: you would think this piston here would be too stiff to be a practical piston? A. I don't know what you mean by "run of mine."

Q. I mean every day driving of motor cars, day in and day out, for example. A. I don't think that piston would run in the Franklin car.

Q. We started to talk about a water-cooled car. A. You mentioned the Franklin.

Q. You think it is too stiff to be a practical piston for common usage? A. It looks like a pretty rigid construction to me.

Q. Of course, that doesn't answer my question. I want to know whether it is too rigid to be practical. A. I would say they would have quite a lot of trouble with that piston for piston slap, if they ran it at clearance enough so it wouldn't freeze or stick.

Q. I suppose you would say the same thing about the piston shown in Exhibit 22 without the relief on there? A. Yes.

Q. Now, this relief that you spoke of, shown in Exhibit 4-A, improves the operation, does it? A. I should judge so.

Q. What do you think makes this piston shown in Exhibit 21 stiff? A. Well, in the first place I don't see that there is any flexibility shown in those ribs, particularly.

Q. The ribs in the heads, you mean? A. These ribs here. There is no slot in the skirt—oh, yes, there is a slot shown on one side. In other words, it is a piston somewhat similar to Exhibit 1; is that right?

Q. Yes, my understanding of it. Now that you have seen the slot in there, do you still say it would be too stiff? A. I would say it would be a pretty stiff piston at that.

Q. Do you think that would be as stiff as this Exhibit 3-Q? A. Well, Exhibit 3-Q is a different design. It might not be stiff in the same places.

Q. In what way is it different; in what way is 3-Q different from the one shown in 21? A. Well, these slots, these four slots in the surface, that has one. This has the wrist pin bosses supported by the skirt, and this has them supported by the webs. And the skirt is made with a small relief on this, and made with a large relief on that. The two pistons are not similar in design.

Q. Well, do you say—I asked you about the stiffness—do you say they have a different kind of stiffness? Why do you say they would have a different kind of stiffness—because of the differences in design that you point out? A. Yes.

Q. Do you find any other differences in them than those you have mentioned; I mean in design, structure? A. Oh, the only thing common is that the thrust surfaces of the pistons are separated from the head.

Q. Is that the only thing you find common between those two pistons? A. That is one thing in common.

Q. But still you haven't said which is the stiffest. A. I couldn't tell that without testing them.

Q. In other words, to express any opinion on these pistons, you would feel that you ought to test them; is that right? A. I do, between those two, to test the absolute stiffness.

Q. You were asked which of the prior art constructions that have been relied upon here, including the patents, you thought was nearest the Gulick. As I understood you, you named several, including the Ricardo. Now, which one of all do you think comes nearest embodying the improvements of the Gulick patent? A. I should say that Ricardo came as close to it as any.

Q. What would be your second choice? A. Let's see: what three did we pick out?

Q. Can't you answer without looking? A. I would have to refer to the three.

Q. Well, take the whole bunch of them there. A. I would say the Long piston came next.

Q. That is patent 1,872,772? And which one do you think is next? What is your third choice? A. Perhaps the Spillman & Mooers.

Q. Spillman & Mooers 1,092,870? A. That is right.

Q. Now, you were asked the same question about the Jardine patent, and I think you named several patents. Will you now tell us which of the prior art constructions here relied upon you think comes nearest embodying the improvements in the Jardine patent in suit? A. I would say it came the nearest to the Ricardo patent 1,294,833.

Q. I will ask you the same question about the Maynard patent in suit.

Mr. Bruninga: You ask the witness, without the slot?

Mr. Richey: I am asking you the whole, taking the Maynard piston as you know it, as a piston in structure, mode of operation, and results, which is the single patent in the prior art, which of the devices relied upon as prior art do you think comes nearest embodying that improvement?

A. I would say the Ricardo piston is as close as any of them.

Q. I would ask the same question about the Mooers patent in suit. A. I think Chenard & Walcker patent might come nearer Mooers.

Q. That would be your choice,—Chenard & Walcker? A. Yes.

Q. Now I ask you the same question about the Schmiedeknecht patent in suit. A. (After examining patent) This patent called Pugh.

Q. British patent to Pugh 17,286; that is right, isn't it? A. Yes.

Q. Now, I suppose beyond the patents which you have named as your choice, with each of the patents in suit, you would have to incorporate features from other constructions in order to get nearer the patents in suit, wouldn't you? A. Yes, I should say that not every feature in each patent in suit was covered by any one patent which I might have picked out.

Q. You take the Ricardo construction as shown in the Ricardo patent as Ricardo showed it. That skirt is not flexible, is it? A. No; he designed that to be a rigid structure, I think.

Q. There is no suggestion in his patent that it might be flexible? A. I don't remember any.

Q. As shown, the webs there would not bend or flex laterally, would they? A. No.

Q. And neither would any part of the skirt? A. No; not appreciably, I wouldn't think.

Q. Would you expect that to operate any differently from a trunk type piston? A. Why, it would operate differently in regard to oil consumption perhaps, and perhaps in regard to cooling. As far as flexibility is concerned, I would say that perhaps having a large relief on the side, might allow those slippers to straighten out or flex so as to draw away from the cylinder wall slightly.

Q. You were here and heard Dr. Jeffries testify about the efforts that were made to make that Ricardo piston better than a trunk type piston, weren't you? A. Yes, I was here when he testified about that.

Q. Have you any reason to disagree with what he said about the efforts, the trouble they had with it? A. No, not particularly.

Q. Take the Spillman & Mooers patent you referred to; as shown in the patent, that skirt isn't flexible, is it? A. No.

Q. There is no suggestion in the patent that it might be flexible, is there? A. Not that I remember of.

Q. Did you ever know Mr. Spillman? A. Not personally.

Q. This Herschil-Spillman Company was located not very far from Syracuse, was it? A. Tonawanda, I think.

Q. And you know that Spillman was, during a number of years, working on this piston problem, don't you? A. Yes.

Q. Did you know of this type of piston shown in this Spillman & Moores patent between 1916 and 1920? A. I think so, yes.

Q. That is, at the time that you were making all these, trying out all these things to improve the Franklin piston? A. Why, some time during that time, yes.

Q. Did you know of the Ricardo piston during that time? A. Yes.

Q. Did you know of the Franquist piston during that period? A. Yes.

Q. How about the Silvercrarth, did you know about that? A. I didn't know that.

Q. Did the other engineers there at the Franklin Company know about the Spillman & Moores piston at that time, to your knowledge?

Mr. Brumiga: I object to that as calling for hearsay.

The Master: Sustained.

Q. Well, did you discuss it with any of them? A. Yes, with some of them.

Q. Did you also discuss the Franquist piston with any of the Franklin engineers during the period you were working on the piston problem? A. Yes, sir.

Q. And the same question about the Ricardo piston? A. Yes, sir.

Q. You said in airplane engines 20 per cent of the heat goes through the piston rings, I believe? A. Approximately.

Q. Did you make any tests yourself to determine that? A. No, I didn't.

Q. Did you take any part in any such tests? A. No, sir.

Q. As a matter of fact that statement is based on what somebody told you, isn't it? A. It is based on what I call general knowledge of the airplane industry,

at least it was general knowledge at the Wright Company.

Q. Well, be that as it may, all you know about it is what you gathered from what somebody said? A. Why, they made tests there in connection with that.

Q. I just want to know whether you know it as the result of your own knowledge or what somebody told you. You don't have to argue or apologize about it. A. Well, I didn't make the tests myself, no.

Q. And your information comes from what they told you? A. Yes.

Q. Now, you said something about the piston rings cocking and letting the gases blow by them. What is the clearance between the piston and the cylinder wall when this occurs? A. Why, a certain amount of blow-by occurs with ordinary operating clearances, say, of .001" per inch of diameter. As the clearance increases the amount of blow-by increases.

Q. When does it become prohibitive, do you know? A. I should say on a 3¼" piston the blow-by would be prohibitive at .012 or .015" clearance, say.

Q. What about a piston that was, say, 4 or 5", say 5" in diameter? A. I should say as the diameter went up the clearance could increase without the blow-by becoming so serious.

Q. When do we reach the limit of what would be tolerated in ordinary use? A. The limit of what—clearance?

Q. Yes, clearance, that causes blow-bys? A. I say in a comparatively small piston, I would say .012 to .015.

Q. Take a piston, say 4½" in diameter, what clearance could be allowed there, what would be the minimum clearance that would be allowed? A. It depends on what kind of service you are talking about. If you are talking about pleasure car service, ordinary driving, that is one thing; if you are talking about racing, that is another.

Q. Let me ask the question first about pleasure cars? A. A 4½" piston?

Q. Yes. A. Why, I should say perhaps you might get up to around .015, .018 in a 4½".

Q. You think while no greater clearance could be tolerated in a pleasure car, you might tolerate it in a racing car? A. I say that might have an effect, yes.

Q. The conditions of use are very different, aren't they? A. Yes, they are different.

Q. That is, you suffer things in one that you wouldn't in another? A. Yes.

Q. You said there was no necessity of splitting the skirt of the cast iron piston operating in a cast iron cylinder. Was that because the splitting would perform no function? A. No, because the expansion of the metal in the cast iron is considerably less than that of aluminum.

Q. Well, why do you say it is not necessary to split an iron piston? A. Because you don't have so much expansion to contend with in the iron piston as you do in the aluminum.

Q. Therefore there is no need of splitting them? A. It is not as desirable, I would say it is not necessary.

Q. Well, that is due to the fact the slit would not perform any function, would it? A. Well, not with clearances which were apparently satisfactory.

Q. And at what clearances would you say it is necessary to split an iron piston, or that the split would perform any function, say a piston of 3"? A. Well, there again it depends upon the type of service you are going to use the piston in; racing service would be one condition and pleasure car service would be another.

Q. Answer the question with respect to pleasure car. A. I would say if you wanted to get a clearance, in the 3¼" piston, of less than 2 or 3 thousandths, it might be desirable to split the skirt.

Q. Of an iron piston? A. Of an iron piston.

Q. You have known iron pistons to be used with .002" clearance? A. Yes.

Q. Were they split? A. No; they were pretty tight, though, at times.

Q. Now, let's take a 3" piston in a racing car, an iron piston, what would the clearance be before a split performed any function? A. I don't know, Mr. Richey, just how those clearances would be in the racing car, but it is customary in racing cars to give iron pistons or aluminum pistons plenty of clearance.

Q. Well, the greater the clearance the less function would be performed or less opportunity for the split to perform any function, in an iron piston? A. That is true.

Q. Now, take a 4" piston, how much would the clearance have to be for the split to perform any function? A. In a racing car?

Q. Yes. A. Well, I say I don't know how much it would have to be.

Q. You would answer the same about a pleasure car? A. I have had more experience in pleasure cars and I think I might say with a 4" piston in a pleasure car, .003" would work satisfactorily.

Q. If you had as much as .010" there would not be any need of splitting them? A. No.

Q. Because it wouldn't perform any function? A. No.

Q. Did you ever attend any of these automobile races such as Mr. Menchmeier testified about? A. I have been at automobile races. I don't know that I saw any race that he testified about, particular race.

Q. His attention was called to some issue of Motor Age describing certain races. Will you examine that and tell us what was the length of these races, I mean one of the races Menchmeier was in? It gives the Menchmeier races, don't it? A. I have to put on my specs to read that. I haven't examined this sheet at all. I see that Staver of Chicago raced here, is mentioned. I judge that is the race he was in.

Q. I think that. I think that is what he said. A. There don't seem to be any distances given on that sheet. I judge this means the length of one class, or race, here—8 miles, 2005 feet; another class 16 miles, 4998 feet.

Q. Now, at the speed they ran those racing cars, how long would the race last? A. The elapsed time in one race here was 16.29 minutes; another race 16.41 minutes.

Q. Now, were you familiar with the Staver car? A. No, sir.

Q. That passed out before your day, I suppose? A. Apparently; at any rate I wasn't familiar with it.

Q. You spoke of modifying the piston shown in the Rainforth patent by cutting the slot through. That piston would then be about the same as your Exhibit B, wouldn't it? A. Yes, similar to our Exhibit B.

Q. These French patents to Serex, what kind of an engine is that that that is used in? A. That is what is called a piston-valve engine, if that is what you mean.

Q. That is, it has a valve, instead of being a piston to which power is delivered, is it? A. Yes.

Q. Tends to open and close the valve? A. That is right.

Q. Now, isn't it a fact that there is a spring fit in the cylinder? A. Yes, a spring in the sense that that

section of the cylinder is sprung out against the wall of the valve and holds the piston against the side, sealing the port.

Q. And as far as the specification is concerned, there is no question of expansion and contraction of the piston due to differences in temperature, is there? A. Well, I don't know what the specification says now, but I think that difference enters into a piston valve.

Q. As far as you know the specification don't say anything about it? A. No, I don't think so.

Q. Now, the Rainforth patent as illustrated in the patent, was fit with a spring fit, isn't it, that is, to be pushed in and operated at all temperatures, spring out against the cylinder wall? A. Does it say that?

Q. You don't know that without reading the specification? A. I didn't know that.

Q. Is that correct (showing patent to witness)? A. That is right.

Q. So that if that is made out of aluminum and put in an iron cylinder, it would engage in the beginning when the thing was cold and the hotter it got the tighter it would engage? A. Yes, except for what the springs did.

Q. Well, the hotter it got the more the spring? A. The more it would spring.

Q. Therefore the tighter it would be? A. Yes.

Q. Take the Hives British patent, that shows two forms of slotting superposed one upon the other, doesn't it? A. Yes.

Q. Would the piston operate the same and get the same results for each scheme of slotting? A. Not exactly, no.

Q. How would they differ? A. I should say the piston with the slot shown in the dotted line, that is with the horizontal slot at the bottom of the skirt, would be a little stiffer and not as springy as the one where the slot ran all the way through.

Q. Do you think there would be any difference in the clearance at which the two would operate? A. Yes, I think the one with the T-slot running all the way through would run with less clearance than the one having two horizontal slots.

Q. And I suppose the one with the H-slot would be liable to score at the bottom if the clearance was small, would it not? A. I should think so.

Q. And that would be due to the fact the slot wasn't continued through, is that right? A. Yes, it would have a tendency to.

Q. Referring to this Schoengarth patent, as long as the expansion ring is tight, the piston would operate like a trunk type piston, wouldn't it? A. Essentially, yes.

Q. Schoengarth don't say anything about operating this piston shown in his patent in any other conditions than with the ring tight, does he? A. I don't remember that he says in the patent that it could be.

(Recess taken while witness looks up patent.)

A. (Continued) After reading the patent No. 1,174,092, I find in the description, the last paragraph on page 1, as follows: "Obviously more or less slight changes might be made in the form and arrangement of the several parts described without departing from the spirit and scope of my invention, and hence I do not wish to limit myself to the exact construction herein set forth."

Q. That is all you find in there on that subject? A. That is all I find.

Q. He locks the ring in position, doesn't he? A. Yes.

Q. This piston, Exhibit 3-Q, is that in your opinion a faithful reproduction of the piston shown in the Franquist patent 1,153,902? A. Yes, I should say it was approximately.

Q. Well, isn't it a duplicate of the one shown in the patent? A. Yes, as near as I can tell without actually measuring the sections and that sort of thing.

Q. Any differences are immaterial. Referring to this Chenard & Walcker patent, as long as the skirt is unslotted, it is not flexible horizontally, is it? A. It seems to me that piston works much the same as the Franquist in that when relieved at the wrist pin bosses it can expand along the line of the wrist pin bosses and the skirt becomes oval in section.

Q. My question is, as shown in the patent the skirt is not flexible in the horizontal? A. I say I think it can become oval; it would be flexible to that extent.

Q. Without being split? A. Without being split, yes.

Q. That is, when you speak of the oval operation, you mean that the piston is elliptical in cross section? A. That is right.

Q. And it expands into a circle? A. No, in that case—yes, to some extent, it is elliptical because of the relief around the wrist pin boss.

Q. That was the principle on which you designed your so-called oval piston? A. That is right.

Q. But as you now see the piston it is not shown oval, is it? A. No.

Q. And when you said it might become flexible, you base that upon the presumption it would be changed so as to be oval? A. That is, it would be relieved around the wrist pin bosses,

Q. You contemplate that change in the piston? A. Yes.

Q. Now, going back to my question, let's take the piston as disclosed in the patent. As the piston is shown it would not be flexible horizontally, would it? A. No, not unless it was relieved around the wrist pin boss.

Q. Then as it is shown there would not be any flexing of the parts *d*, would there? A. No.

Q. There is shown in Fig. 2, up above and down below the bosses, some curved lines. Do you understand those to be webs in the horizontal? A. In the head, yes.

Q. No, A-B, it says, is a horizontal view along the line A-B. You must be looking down because you see the bosses, don't you? A. No, I think you are looking in this direction, because you see these webs.

Q. But you see the bosses, don't you? A. Yes.

Q. So you must be looking down from the top? A. I don't think so.

Q. How could you see the bosses looking up in the section along A-B? A. Well, that is right.

Q. That is the section looking down, then, isn't it? A. I guess it is.

Q. Then those lines I referred to, show webs that are below the head? A. What do they show in this view? I don't see any indication of where those are in that view.

Q. Then the two views are inconsistent with each other? A. Well, I don't see it, do you?

Q. Well, I am asking you. You are the expert. What do you understand those lines that I am referring to, show? A. I understand they refer to these ribs up here.

Q. But they are up in the head, and you are looking down in the skirt. A. Wait a minute. I will tell you what that is: these ribs in the head, while they don't show in this view, they run down below this section, so

that these ribs up here actually run out into the head on that radius.

Q. Then you would see them in section, wouldn't you; if they pass from the head to the skirt, the line A-B would cut them and you would see them in section? A. Not if they pass from the head to the skirt down below this section.

Q. How could they pass? A. From the ring lands.

Q. You don't see any such thing in Fig. 1? A. No, I don't.

Q. Therefore the only explanation you have for it is that the views would be inconsistent with each other? A. Yes.

Q. You and I have been referring to the line which I mark X, haven't we? A. Yes.

Q. Don't you think those are webs of the piston behind the bosses? A. What do you mean?

Q. Well, connecting the bosses to the inside of the skirt?

The Master: Wouldn't the reading of the patent specification clear that up?

Mr. Richey: No; they don't say.

A. Well, that is kind of a riddle; what he had in mind when he drew that, I don't know.

Q. That is, this disclosure is a riddle to you? A. That particular feature is to me.

Q. Can you tell me how many ribs there are in the head of this Chenard & Walcker patent? A. I should say three; that is two shown in section in Fig. 1, and one shown in full line.

Q. That is just your opinion,—it doesn't show how many, does it? A. That is what it shows to me.

Q. Those ribs would stiffen the member *d-d*? A. Yes.

Q. Referring to the Spillman & Mooers patent again, that piston would be rigid in the horizontal, as shown in the patent, wouldn't it? A. Without the slot, yes.

Q. And there would not be any flexing of the skirt in operation, without the slot, would there? A. I should say not.

Q. Or of the webs? A. No.

Q. Do you find anything in the Spillman & Mooers patent about splitting the skirt? A. No, I don't remember that.

Q. Now, the operation of this piston 3-P would be different from that in the Spillman & Mooers patent, wouldn't it? A. Yes; because this piston is split.

Q. And that makes a new mode of operation? A. It makes it flexible.

Q. Well, it makes it operate differently from what is shown in Spillman & Mooers? A. Yes.

Q. And gives a different result? A. Yes.

Q. Of course if you split the Chenard & Walcker skirt, you would get in the same way a different mode of operation and result from what is shown in the Chenard & Walcker patent? A. Yes.

Q. And the same thing would be true splitting the Ricardo skirt? A. Yes.

Q. This Long patent, 1,872,772, shows no relief at the bosses, does it? A. No.

(Thereupon adjournment taken to 9:30 a.m. following day.)

(Thereupon at 9:30 a.m., Wednesday, February 1, 1933 the hearing was resumed.)

Q. Mr. Stellman, you spoke of bushings having been used in iron pistons. Were they used in the Franklin piston? A. In cast iron, yes.

Q. To what extent were they used in the Franklin? A. I should say quite generally in cast iron pistons.

Q. That was a hollow cylindrical bearing that was put in the boss? A. Yes.

Q. Of what metal was it made? A. Bronze, usually.

Q. What was the purpose of it? A. Well, a sort of cushion; it gave a bearing between the wrist pin and the bearing and not to let the wrist pin bear directly in the cast iron.

Q. Was that standard with the Franklin Company? A. Yes, I think so.

Q. Who else was it standard with? A. My impression was that it was the general practice prior to 1915, most of the time.

Q. But as far as your personal knowledge goes, what other companies besides Franklin? A. I can't designate any particular company. I could look it up for you, if you want.

Q. Now, the aluminum piston didn't have to have that extra bushing in there? A. No.

Q. That was a further advantage of the aluminum piston over the iron piston? A. That is right.

Q. This Exhibit 3-H hasn't any places for the set screw? A. No, that evidently wasn't the bushing type.

Q. That wasn't typical then, of the cast iron pistons that were used? A. Not prior to 1915, in that respect.

Q. This is a later piston? A. I should think so.

Q. When was the use of these bushings discontinued in iron pistons, if it was? A. Why, I think the use of the wrist pin direct in aluminum pistons called attention to the fact that it might be perfectly satisfactory in the cast iron, and it was so used after the aluminum piston more or less demonstrated the construction.

Q. You don't find any such hole in this Exhibit 3-V piston, do you, for the set screws? A. No. Of course you understand that those bushings were held in by other means than set screws.

Q. What other means were used? A. Oh, pinned in; after the bushing was pressed in there a pin was drilled down so that it intersected both the bushing and the piston walls.

Q. Well, that would mean a slot in the piston of some kind? A. No.

Q. In other words, a key? A. No; the bushing would be pressed in and a pin drilled down through the boss here so that this pin would intersect both the bushing and the wrist pin boss.

Q. You would have a hole in there? A. No, not until after the bushing was put in.

Q. There would be a hole in the boss after the pin was put in? A. Yes, after the pin was put in there would.

Q. That is, wherever the pin was used, there would be some evidence of it on the piston? A. I should think so.

Q. Such as a hole? A. I should think so.

Q. As far as you know, wherever a bushing was used, you would find some kind of hole there, and you don't find any such evidence in Exhibit 3-V? A. No, I don't find such evidence.

Q. This Exhibit 3-V has a chip in one of the bosses. Would a piston having such a chip in it pass inspection? A. No, not in a new piston.

Q. Or if it had a defect in it that was liable to result in such a break, it would not pass inspection, would it? A. No.

Q. Do you find any statement in the Gulick patent in suit to the effect that a bushing or journal was used inside of the boss? A. I don't remember any statement in the patent to that effect.

Q. Well, can we leave it this way: that you read the patent over, and unless you point out something—

Mr. Bruninga: Oh, Mr. Richey, I admit there is no statement at all as to bushing in the Gulick patent structure. You don't need to take this witness' time on that.

Q. Now, the only reference that you find in the Franquist patent which you claim might be taken as referring to a bushing or journal is that at the bottom of the first column, page 1; is that right? A. Yes, I would say that is the one referred to, I think.

Q. Now, referring to the Ebbs patent, I believe you said that that shows a piston for a marine engine? A. That shows the marine type of connectors, I think that was the statement.

Q. You would conclude from that that was intended for a marine engine, would you? A. Perhaps.

Q. Well, you don't know of the use of the marine type of piston or piston having what you call a marine connecting rod arrangement, being used except on a marine engine? A. No; but that patent was taken out in 1902; I wasn't very familiar then with it.

Q. 1899. Of course the marine engines were good sized engines, weren't they? A. Yes; yes, I would say they would be.

Q. There were very few if any gasoline engines used for marine work at that time, weren't there? A. I don't know; I don't think they came into general use at any rate until after.

Q. Of course this application was filed in 1899, see? A. Yes.

Mr. Richey: Now, I ask that this piston be marked for identification Plaintiffs' Exhibit 34. (So marked.)

Q. Will you look at that and say whether or not it has been made in accordance with the drawing of the Ebbs patent?

Mr. Bruninga: The witness is advised to take it apart in order to determine it.

Mr. Richey: Sure he can take it apart, or do anything else he wants to, to look at it.

The Witness: Have you any tools?

Mr. Richey: I haven't any tools.

The Witness: If I had a screw driver and a wrench I could take it apart. Let's say for the purpose of going on that apparently is made after the Ebbs patent, until we have a chance to examine it.

Q. So far as you can see from looking at the outside, it is in accord with the Ebbs patent? A. Yes.

The Master: That is subject to his later examination, with the privilege to modify or supplement his answer if he wishes on the record.

Q. The Ebbs piston such as shown in the drawing of the patent in Exhibit 34, would be rigid in a plane transverse to the direction of the wrist pin, wouldn't it? A. At right angles to the wrist pin?

Q. Yes. A. Yes, sir.

Q. Now that we have gotten this Exhibit 34 apart, will you compare it with the drawing of the Ebbs patent and state whether or not it is a faithful reproduction of the same? A. I should say it was, in principle, the same thing, yes.

Q. Well, do you find any differences between the two? A. No, not just by glancing over it.

Q. Well, look at it carefully and see if you find any differences. A. I don't find any, Mr. Richey.

Q. Now, you have said something about the relation between the flexing of the web at the top in Exhibit 1 and in the Jardine patent, and you said that there would be more flexing in the Jardine patent than in Exhibit 1. That would be a difference in amount or degree, wouldn't it? A. Yes.

Q. The piston of the Anderson patent which you discussed was one of those light iron pistons in which it was undertaken to overcome the heaviness of the cast iron piston then in use, wasn't it? A. That is what he states in his description.

Q. And none of those skeleton iron pistons came into use to any extent, did they? A. Not that I know of.

Q. Is it true that the following patents which you have discussed here show no relief; the Ebbs patent, the Long patent, 1,395,441, the piston Exhibit B, both the Monckmeier pistons, Exhibits 3-V and 3-W, the Van Bever patent, the Vincent patent, the Pugh patent, and the Schoengarth patent? A. I think the wrist pin relief is not shown on any of those stated. (After examining citation.)

Q. You have just examined all the pistons I referred to and you don't find any wrist pin relief? A. The Van Bever and these two (indicating Exhibits 3-V and 3-W) were the only models you called for?

Q. Yes, those were the only two models, and then the patents. A. Yes.

Q. Now, you said in your opinion the nearest patent in the art to Gulick was, first, Ricardo; second, Spillman & Mooers; and third, Chenard & Walcker? A. I think that is right.

Q. Isn't it true, to get the Gulick mode of operation and result, each one of those pistons would have to be modified in some way? A. Yes.

Q. Now, you said that in your opinion the nearest thing in the prior art to each Jardine and the Maynard patents was the Ricardo piston. To get the mode of operation and results of either Jardine or Maynard, the Ricardo piston would have to be modified in some way, wouldn't it? A. Yes.

Q. Now, when you said the Chenard & Walcker was the nearest thing like Ray Day, the Chenard & Walcker piston would have to be modified in some way to get the mode of operation and results realized in the Ray Day piston; that is correct, isn't it? A. Yes.

Q. Now, what piston of the prior art do you consider to be the nearest like Exhibit CCC? A. (After examining same) I should think the Franquist would come as close to that as anything.

Q. What would you say would be the nearest to Exhibit BBB? A. (After examining) There again I should think the Franquist might be as close.

Q. And I believe you said you thought Chenard & Walcker was nearest like the Ray Day? A. (After examining) Yes.

Q. Now, will you answer the same question with respect to Exhibit 3-O? A. (After examining same) I should think the Franquist would apply to that as closely as any.

Q. Would your answer be the same with respect to Exhibit 3-J? A. Yes.

Q. Is it your notion that the piston, Exhibit 3-O, would operate like and get the same results as Exhibit 3-J, assuming the slots cut through 3-J—you have been assuming that all along? A. Yes. Essentially the same, I should say.

Q. And your answer would be the same in comparing 3-O and 3-J with CCC? A. (After examining same) Yes.

Q. Referring to the Long patent 1,489,499, I believe you said the webs 8a would be flexible. A. To a certain degree I should say they would.

Q. And in saying that you assume the piston would be made of the material ordinarily employed in making pistons? A. Yes.

Q. And the same thing would be true of these webs 17, 18, and 19 in the Gulick patent, wouldn't it? A. Yes.

Q. Anybody understanding pistons and skilled in the piston art would know those webs would be flexible if made of the material of which pistons are ordinarily made, wouldn't they? A. Yes, if they were not tied in any way, as shown in this piston.

Q. You wouldn't need anybody to tell that or describe that to you; you could tell that from the drawing, couldn't you? A. I expect I could.

Q. That is, with your knowledge of the piston industry you would know by looking at the drawings that those webs would be flexible if the piston was made of material of which you ordinarily made pistons? A. Yes.

Q. Do you think this Exhibit 20 was a fair reproduction of Figs. 1 and 2 of Gulick? A. (After examining) I should say in general it was made after the Gulick patent.

Q. Do you see any differences between this patent and the Figs. 1 and 2 of the Gulick patent? A. The internal ribbing; there are some slight differences in the ribs on the vertical surfaces. These two ribs near the bottom are not shown on the drawing, but I think in general it was made to follow that design.

Q. The mode of operation and the results of the two would be the same? A. I should think so.

Q. Now, the Gulick piston is flexible at the top of the skirt and at the bottom and all the way along, isn't it? A. Yes.

Q. Will you look again at Exhibit 1? Between the boss and the head on the outside there is a web. That helps to support the boss, doesn't it? A. Yes.

Q. And that goes direct to the head from the boss, the front part of the boss? A. The outside part of the boss.

Q. While you were at the Franklin Company, the pistons that Mr. Long brought to you might have been classified as follows, might they not: A: original type, Magnalite, sand cast, rib on one side only. B: special type with two ribs at right angles to wrist pin, and entire part of the periphery of the piston supported by these ribs only. C: die cast Lynite of the type of A, with the exception that the slots were cast in and supporting

ring at the bottom is omitted. A. In answer to A, I don't know what that rib on one side only refers to. I cannot remember any Long piston that would come under that heading. (After section B is read by reporter) I should judge that referred to what we commonly call the Long piston. (Witness refers to Defendants' Exhibit F.) (After reporter reads section C) I cannot identify that A, and this C refers to A; I can't identify that.

Q. That is, you don't know whether these pistons are correctly identified in the preceding question? A. That is right.

(Short recess taken.)

Q. You don't know or don't remember that that is the way that they have been classified at the Franklin plant? A. I can't remember that classification.

Q. Now, is it a fact, Mr. Stellman, that up until the first part of 1919 the pistons that Mr. Long brought to you were pistons like Exhibit B with certain changes therein with reference to the length of the slots and the ribbing, and that it was not until the first part of 1919 that he came to you with pistons having struts in them, such as shown in Exhibit E, and then he came with a variety of such pistons? A. No, sir, that is not the fact.

Q. You say that is not correct? A. Yes.

Q. Well, isn't it a fact that of the pistons that were submitted to the Franklin Company and tested out, all the pistons up until the first part of 1919 of Mr. Long, were like Exhibit B with the modifications I have mentioned? A. Will you state those modifications?

Q. Like Exhibit B except that the vertical slots were changed in length or were changed in ribbing, but no horizontal slot in any of them? A. No.

Q. You say that is not a correct statement? A. No; because Mr. Long never brought a piston like Exhibit B to us.

Q. Well, the pistons that contained suggestions that were made by Mr. Long that were tried out by the Franklin Company prior to 1919 were such as I have mentioned; that is, like Exhibit B with those variations in it? A. Well, Mr. Long never brought us what we called the Van Bever type of piston, if that is what you mean by your question. My memory is that the piston designated by F is more like Mr. Long's early pistons than it is like B.

Q. By "early pistons" you mean prior to 1919? A. Yes.

Q. That is just your recollection, though? A. That is all.

Q. Didn't he submit to you several forms of pistons having the struts on the inside? A. Yes.

Q. Were any of those like shown in the Long patent 1,395,441 and 1,489,499? A. I don't remember his showing me that particular type, although he might have.

Q. That is, in the patent 1,489,499. But you are not very certain that he did or not? A. No.

Q. And when was it that he showed you pistons like Long patent 1,395,441? A. Some time between his first visit and in say, March, 1919.

Q. But you are not very certain about the date? A. Not the date.

Q. Which one did he show to you first; the one like E or the one shown in the patent 1,395,441; I mean the general form, if there is any distinction between those two; I mean the six-slot piston with the strut. Did he show you that first, or the one shown in patent 1,395,441?

Mr. Bruninga: You mean Exhibit F?

Mr. Richey: Yes, Exhibit F; piston of that general character.

A. I should say that the one shown in this patent might have preceded this Exhibit F.

Q. But you have no very definite recollection of it? A. No.

Q. Did he show you any other pistons than those two? A. Oh, I think likely.

Q. He had a number of different designs? A. Yes.

Q. And showed them to you at different times? A. Yes.

Q. And it is difficult for you to keep straight just which one was shown you first? A. Except that I am very sure that the piston that attracted my attention originally that Mr. Long brought to show us in 1916 had ribs of this type in a general way so that these skirt walls could flex. (Referring to Exhibit F.) That is what interested me and made the deep impression on me in 1916.

Q. You, however, didn't think well enough of that piston in 1916 to have the Franklin Company test it, did you? A. No, not just at that time.

Q. And that was at the time when you were running the pistons like Exhibit B in your cars, wasn't it? A. That is right. I want to call your attention to the fact in that connection that the Franklin Company was then getting ready to manufacture parts for Rolls-Royce en-

gines for the British Government, and our experimental work was more or less interrupted during the years after March, 1916 until after the war, and that was the real reason why we didn't give perhaps more thought and testing to the Long piston at that time.

Q. Well, you didn't think enough of it even to make a record at the Franklin plant, did you? A. No, I don't know as I did; at least I didn't find any.

Q. Do you say that the Franklin Company made no improvements in its cars between 1916 and 1919? A. No, I didn't say that.

Q. You kept on developing the car, didn't you? A. To some extent; the experimental work was curtailed very materially.

Q. Did you make any change in your piston at that time? A. We used substantially that Van Bever type piston in that time.

Q. Didn't you try out other pistons in that time similar to those I named yesterday? A. Yes, perhaps, although I can't say we did very much experimental work on pistons between 1916 and 1919.

Q. Do you remember where Mr. Long's place of business was in 1916? A. I think either Hannibal or Quincy.

Q. Do you know which one? A. No, I don't.

Q. What year was it that the Franklin used an expanding ring in the groove in the bottom of the piston? A. I don't think they used it in production.

Q. Well, you said they used it in replacement. A. For use in service.

Q. What year was that? A. Well, I would say that was 1917, perhaps.

Q. Either the latter part of 1916 or the first part of 1917? A. I should think so.

(Short recess taken.)

Q. Now, isn't it a fact that weekly, if not daily, during 1917 and 1918, pistons were being tested in the laboratory of the Franklin Automobile Company? A. Perhaps to some extent.

Q. Well, isn't my statement about a correct one? A. As I have said before, we curtailed our experimental work very materially.

Q. I know you said that. Now answer my question. No use saying that over again. A. I couldn't say they were being tested daily.

Q. Or weekly? A. Or even weekly.

Q. Well, they were tested monthly during those years? A. Perhaps so.

Q. And during that time you were testing virtually all of the pistons that I named yesterday, and you said had been tried out at Franklin? A. I don't remember just what we were testing then, Mr. Richey.

Q. Do you remember any piston that was tested in 1917? A. Oh, we did a good deal of work on that Van Bever type piston, I remember that.

Q. That is Exhibit B with the ring in it? A. Yes, and without the ring.

Q. Let's take the first part, take January, 1917, isn't it a fact pistons were being tested on January 20 and January 27, 1917? A. I don't know.

Q. Isn't it a fact they were being tested on February 3rd, February 10th, February 17th and February 24th, 1917? A. I couldn't testify as to those dates.

Q. You can't say whether that is right or wrong? A. No.

Q. Now, isn't it a fact that tests—those dates I have named are typical of the activity in the Franklin testing on pistons during 1917 and 1918? A. I couldn't say as to that.

Q. What was your position there during 1917 and 1918? A. Assistant chief engineer.

Q. Did you have charge of the testing laboratory? A. It came under my supervision, yes.

Q. And you were in close contact with it? A. Yes.

Q. Take those two years, 1917 and 1918, what is your best recollection as to how many times pistons were tested at the Franklin Company during those years? A. A good many times.

Q. And a good many different kinds of pistons were tested? A. Yes, but I want to state again our activities centered on the Van Bever piston during those days.

Q. That is a change in the Van Bever piston? A. Yes.

Q. That is, you changed it and then tested it? A. Yes.

Q. And what was the purpose of all those changes? A. To get it to work better.

Q. Wasn't the Wainwright piston tested in June, 1917, in the laboratory at the Franklin? A. It may have been.

Q. You don't remember? A. No, not as to that particular piston.

Q. Well, it was tested a number of times during that period, wasn't it? A. It was tested during the period, yes.

Q. That is, during 1917 and '18? A. Yes.

Q. And of course that wasn't the Van Bever piston, was it? A. No.

Q. You also tested cast iron pistons during that period? A. Well, the Wainwright was a cast iron piston.

Q. You also tested composite pistons during that period, didn't you? A. I don't know whether we tested them during that period or not. We tested them sometime.

Q. You tested the Zethyr piston during that period, didn't you? A. I think so.

Q. And that wasn't the Van Bever piston? A. No.

Q. Didn't you during that period test pistons having aluminum heads and cast iron skirts? A. I don't remember.

Q. If you did that wouldn't be the Van Bever piston? A. No.

Mr. Richey: That is all.

RE-DIRECT EXAMINATION by Mr. Bruninga.

Q. When you said Exhibit 3-Q was a duplicate of that shown in the Franquist patent, did you have reference to the specific dimensions? A. No, sir, the general structure.

Q. When you said that the Spillman & Mooers structure would have to be modified in order to operate as the Gulick patent structure, what did you have in mind, what modification? A. Well, of course it would have to be slotted. You are referring to the Spillman & Mooers as shown in their patent?

Q. Yes. A. And the point where the ribs are leading down from the head to the skirt would have to be raised to be more nearly central with the wrist pin boss.

Q. You have now in mind the specific structure shown in the Gulick patent, the web?

Mr. Richey: Object to that as leading.

A. Yes.

The Master: It may stand.

Q. When you said the Ricardo piston would have to be modified to have the mode of operation of the Jardine patent, what did you have in mind as the principal modi-

fication? A. The Ricardo piston is not slotted and the slot would have to be added to the Ricardo piston to make it similar to the Jardine.

Q. I believe you said that with reference to the Maynard patent the closest refefence was the Ricardo piston. Did you have in mind any slotting?

Mr. Richey: Object to that as leading. Let him say what he had in mind.

The Master: He has answered it.

Q. Well, the Ricardo doesn't show the slotting. What did you have in mind, then? A. I meant the Ricardo piston slotted would resemble the Maynard patent.

Q. And when you said on cross examination in your opinion the Chenard & Walcker approached the Mooers patent in suit, what feature did you have in mind? A. As I remember it, in the patent to Chenard & Walcker it says that the ribs running from the head to the skirt or to the wrist pin bosses can be arranged in any way which would suitably give the desired results. If the ribs of the Chenard & Walcker were brought out to the wall of the piston, we would have very much the same result as in the Mooers with these ribs removed.

Q. How about the Franquist patent in that connection? A. The same thing would apply.

Q. Now, you said that the Ricardo piston was a rigid structure. Why do you say that? A. Because of the fact that it is not slotted and the rib and the skirt form a box section which is essentially rigid.

Q. What work would be required to make it flexible? A. The slotting of the skirt and the change in dimension of the ribs, perhaps.

Q. Well, refer to that patent, the Ricardo patent, and state what dimension of ribs would be required? A. The ribs shown at C in Fig. 3 might have to be thinned up some, and the skirt about at the point referred to in Fig. 3 by the letter E would have to be slotted.

Q. You are referring now to the specific dimensions as shown in the patent drawings, is that right? A. There are no dimensions shown in the patent drawings, sir, but the general view would indicate the size of the sections.

Q. Has it been your experience that Patent Office drawings are made to scale to indicate thicknesses of parts? A. I don't think necessarily, no.

Q. I believe you said on cross examination that you knew about the Ricardo patent structure at the time you were in the Franklin Company. Was that before or after the Long piston came into use? A. Before the Long piston came into use.

Q. That you knew about the Ricardo structure? A. Yes.

Q. Do you know about what year that was? A. I should say in 1915 or '16, along in there.

Q. Who submitted to you the Ricardo structure? A. Nobody submitted the Ricardo structure, but I saw it in publications, and general knowledge of the art.

Q. You didn't see an actual piston, then, did you? A. No, not that I remember.

Q. Having reference to the Serex French patent, it was brought up in cross examination that this is not a power piston. What function is performed by a piston valve with reference to necessity for sealing? A. A valve, from necessity, must seal the ports of the engine and be tight under various operating temperatures.

Q. At what speed, so far as revolutions per minute, does this piston valve in an internal combustion engine operate with reference to the power piston? A. With a four-cycle engine, I should say it would run half the speed of the piston in the engine.

Q. Is it desirable that there be slap of the piston valve? A. No, the valve must be quiet as well as the piston of the cylinder.

Q. With reference to the Hives British patent, Mr. Richey called your attention to the H slot that would be formed if the lower dotted slot were used instead of the slot a' going clear to the end of the piston, and I believe you said there would be liability of scoring; is that true if the slot a' extends to the end as shown in full lines? A. No, I would say that would help that considerably.

Q. Even with an H-slot what would you say if the piston of the Hives patent is oval, that is, with the small diameter along the line of the wrist pin axis? A. If the piston was ground oval, of course that would help the action materially, and also if the portions over the horizontal slot at A and the dotted slot at the bottom were relieved, that would help the action, too.

Q. I want to call your attention to a photostat of the March 12, 1914 number of The Automobile, pages 602, 603 and 604, marked for identification as Defendants' Exhibit 4-J. I want you to refer to Fig. 1 and read the part on page 603 under the sub-heading "Prismatic pis-

ton surface" before I ask you any more questions. A. (Witness complies.)

Q. Do you understand that? A. Yes, sir.

Q. What kind of a piston will be produced in that operation described on page 603, to which I have referred, is performed? A. First, they put a piston in the engine and run it and obtain evidences of where the piston is tight. Then they relieve the spots where they are tight and put the piston back and run it again, perhaps a little harder the second time. They again take the piston out and examine it, relieve it again where it shows tight, and continue that performance until they get a piston which operates to their satisfaction. Then they take this piston and use it as a pattern in a copying lathe or copying grinder, and produce other pistons similar to the piston which was run satisfactorily in the engine.

Q. Where will the piston show wear in such an operation? A. Well, it depends on the design of the piston, I should say.

Q. Well, a straight trunk piston, for instance as illustrated in Fig. 2? A. One of the places where it would show wear would be around the end of the wrist pin bosses.

Q. When you get through with such an operation, what will be the cross section of the piston? A. I should say it would probably be slightly oval with its center line through the wrist pin bosses.

Q. With its shortest diameter where? A. Parallel to the wrist pin.

Q. What relation has such a piston to the oval piston which you have been examined about that was used by the Franklin Company? A. In general the same result was obtained by grinding the piston oval as they show in that article.

Q. How did you proceed to grind them oval at the Franklin? A. We did it with our grinder, which was tooled up to grind the oval section.

Q. How did you obtain that oval section; did you compute it or obtain it experimentally? A. We obtained it experimentally by grinding off the sides of the piston walls until we got it ground down far enough.

Q. Now, the March, 1914 issue of The Automobile, photostats of pages 558, 559 and 560 of which I have marked for identification as Defendants' Exhibit 4-K, contains an illustration, Figs. 1 to 4, and contains the following statement: "What is now being done to offset these effects of uneven convection of heat? In some

cases the whole piston is made slightly oval by flattening it over the whole length of both sides. If this is found to be unnecessary, a place is flattened around each piston pin hub. If the pistons are not only turned but also ground, this flattening may be done conveniently by simply mounting them with the hubs sprung slightly apart, and when the hubs spring back after the grinding is done, the piston surface near them will be found to recede somewhat from the circular form." What will be the cross section of such a piston if it undergoes such an operation? A. If you take thi cast iron piston, for instance,—

Q. Exhibit 3-H. A. —and expand it along the diameter of the wrist pin, put that expanded piston in a grinder and grind it so that the circle is round, after it had been expanded, then take it out of the grinder and take this expander block away, the piston will have become oval, with the shortest diameter parallel to the wrist pin.

Q. Do you understand English? A. Yes.

Q. Is it your idea that the expression "extremely rigid" means the same as "very flexible"? A. I should not think so, no.

Q. As a matter of fact, those expressions are as wide apart as the poles, aren't they? A. Diametrically opposed, I should say.

Q. In any trunk piston or in any piston, as for instance in the Gulick patent, having webs such as 17 and 18 along the line of thrust, what have you to say about the pressure on those webs, in what direction is it as far as thrust pressure is concerned, when operating in a cylinder? A. With the piston slotted as shown in the patent?

Q. Slotted or unslotted. What direction is the line of thrust? A. I should say the line of thrust in this case would be out parallel to the direction of the web.

Q. The Gulick patent, page 1, line 16, *et seq.*, states: "Another object of the invention is to rigidly support the piston pin bosses of a piston from the piston walls against mechanical load thrust from the connecting rod." What would that require as far as rigidity is concerned, in what direction would your rigidity be? A. The rigidity would have to be in this plane of the web as shown in Fig. 2, web 19, to be rigid.

Q. Does the statement, as far as I have read it, convey to your mind a rigid structure? A. As far as you have read, yes.

Mr. Brumnga: I want to offer in evidence at this point the file wrapper and contents of the Gulick patent in suit, as Defendants' Exhibit 4-L.

Q. Considering now the structure of the Gulick patent as shown in the drawing, how would you construe the following statement: "It will be seen that in addition to providing a piston with a split skirt, the above described construction also provides extremely rigid connection between the piston pin bosses and the guide portion of the piston, which construction may be used either with or without the split skirt and separated head. The arrangement of the supporting flanges 17 between the ends of the piston pin bosses and the connection of these flanges with the piston skirt provide a particularly strong support for the bosses." I am reading from Exhibit 4-L, page 4, a paragraph of the original application as filed. Will you tell me whether that conveys to your mind that the webs 17 and 18 were designed to be very flexible or extremely rigid?

Mr. Richey: Objected to as leading.

The Master: Same ruling.

A. He describes a very rigid section between the wrist pin bosses and the skirt of the piston, designated by 17 and 18 in Fig. 4.

Q. Would that convey to your mind that the structure was intended to be very flexible? A. No, sir, I should say that he intended that it should be rigid.

Q. But if the structure is split as shown in the Gulick patent, you understand that the structure would flex; in other words the slot would close? A. Yes, sir.

Q. What have you to say about the Chenard & Walcker and the Spillman & Mooers structure, if split between the wrist pin bosses? A. They are flexible also.

Q. Is that due to any special construction or inherent flexibility? A. Inherent flexibility in that type of construction shown.

Q. And the Gulick patent structure as shown will flex if the webs will flex, and if the slot will close? A. Yes.

Q. Can you tell me whether or not the Spillman & Mooers patent structure would have the same or different action as far as closing of the slot is concerned? A. The same, I would say.

Mr. Richey: You mean if you split the Spillman & Mooers?

The Witness: Yes, that is what he said.

Q. That is what you understood; is that right? A. Yes.

Q. In considering the Gulick patent you had reference to the Ricardo structure. Can you tell me whether the addition of the circumferential part outside of the webs 18 has any effect upon the flexibility of the structure? A. I would say not.

Q. Well, as far as—I mean as far as the flexing of the webs is concerned, these are continuous arcs on the outside of the webs 17 and 18? A. I thought you said slot. If those were continuous arcs, of course that would stiffen the web materially.

Q. More or less than in the Ricardo structure? A. More.

Q. In other words what flexibility must you rely upon in the Gulick structure, if there is any flexibility, flexibility of webs or flexibility of skirt? A. Flexibility of webs.

Q. And must you rely upon the flexibility of the webs in the Gulick structure? A. Yes.

Q. How about the flexibility of the part opposite the slot 21? A. That would flex somewhat; quite a little.

Q. You notice that in Exhibit 20 there is no wrist pin, is there? A. No.

Q. If the wrist pin were placed in that structure, do you think it would affect the flexibility? A. Probably stiffen it.

Q. If the wrist pin was left out of Exhibit 3-P, would that affect the flexibility? A. Make it more flexible.

Q. Now, referring to the Chenard & Walcker patent structure, the parts which are shown in Fig. 2 and which seem to curve from the webs "d" to the skirt of the piston are not described at all. You have said that on direct examination? A. Yes.

Q. You don't know, then, what they indicate? A. No.

Q. But what do you find in the Ray Day piston Exhibit 8, with reference to inside webs? A. The webs are shown as being from the head to the wrist pin boss.

Q. But I mean the inside circumferential webs or ribs? A. There are ribs shown in the interior of the skirt, these ribs here which are strengthening ribs.

Q. In fact there are three, one at the top, one intermediate, and one at the end; is that right? A. Three, yes.

Q. And those two, the one at the top and the one in the middle, connect right with the wrist pin boss? A. That is right.

Q. Do you find that flexible? A. Yes.

Q. What are the circumferential parts, the inwardly extending circumferential parts, in Figs. 1 and 2 of the Gulick patent; one of them is a short distance above the bottom of the skirt, and the other is about in the line of the wrist pin bosses, and still another one above the wrist pin bosses; what do you take those to be? A. They are circumferential ribs on the inside of the piston.

Q. What is the part at the bottom, extending inward? A. That is another rib at the bottom of the piston.

Q. And what do you find at the top, at about the line indicated by 15? A. Line indicated by 15 is a groove backed up by a rib on the inside of the piston.

Q. But what forms the groove 15, I mean is it cut in there or does the skirt extend straight up? A. Cut in.

Q. Now, what do those surrounding parts do to the skirt, do they make it more flexible or stiffer? A. Those circumferential ribs stiffen it.

Q. There are grooves on the outside of the piston opposite those annular ribs, we might call them, is that right? A. Yes.

Q. Do you know what the function of those grooves is? A. I should say perhaps carry oil on the surface of the piston.

Q. You said on cross examination, I believe, that as shown in the drawing a piston of the Chenard & Walcker patent was not oval. You didn't measure it, did you? A. No.

Q. What do you take this statement to mean in the translation: "It is known that pistons of this kind cause the cylinders to wear into an oval shape, and in order to try to eliminate this inconvenience they are given quite a complex section by machining them or reproducing on copying lathes in order that upon expansion they may closely fit the walls of the cylinders." What do you understand that to mean as to the practice? A. I should say, in general, that the piston was relieved on the sides opposite the end of the wrist pin boss.

Q. That is, that is what that statement refers to? A. Yes.

Q. Do you know, are you familiar with tin cans? A. Yes.

Q. Are you familiar with the idea of rolling beads in tin cans? A. Yes.

Q. What are those beads put in there for? A. They stiffen the side walls of the can.

Q. Can you tell me what the inevitable result, if any, of splitting the Spillman & Mooers and the Chenard & Walcker piston will be? A. It will make them more flexible.

Q. Do you know whether bushings are ever used in aluminum pistons? A. We thought at first that we would have to bush a boss of an aluminum piston, but we found that not necessary. I don't know of any case where bushed wrist pin bosses are used on aluminum pistons.

Q. Referring to Exhibit 3-V and the chip on the wrist pin boss, does that look to you that it might have been done when the piston was originally made or can you tell from the looks of that whether it was in there before that piston was ever used? A. My guess would be that the piston wasn't used in that condition.

Q. What makes you think so? A. I don't think a man would use a piston like that, he would be afraid that wrist pin boss would crack open.

Q. But can you tell by looking at it? A. You can't tell by looking at it whether it was used or not, but it would be my thought he wouldn't want to use it like that.

Q. Mr. Richey asked you on cross examination whether the flexibility of Exhibit 1 and the Jardine patent structure was one of degree, and I believe you answered yes. What did you have in mind when you made that answer, that the flexibility was the same? A. No, it was comparable in degree.

Q. And how in degree? A. One might be more flexible than another in degree.

Q. Well, the webs 25 of the Jardine patent are described as flexible. Do you find flexible webs at the top in Exhibit 1? A. No; and Exhibit 1 is stiffer at the top than the Jardine.

Q. Well, as far as the piston structure at the bottom is concerned, how does the flexibility of Exhibit 1 compare, for instance, with the flexibility of Exhibit B, that which you call the Van Bever piston, as far as flexibility of the bottom is concerned, assuming the slots to go up the same distance? A. Well, there being more slots in the Van Bever, I should say it may be a little more flexible than Exhibit 1.

Q. If there was only one slot? A. If there was only one, it would be the same.

Q. Now, I want to call your attention to Exhibit 3-W, the Monckmeier aluminum piston. Does that have a relief in the region of the wrist pin bosses? A. There is a relief above the wrist pin boss all the way around the piston. I don't see any indication that this piston was relieved around the end of the boss.

Q. Well, look at the Pugh British patent 17,256. What have you to say as to the presence or absence of a relief there in the region of the wrist pin bosses, Fig. 3, in the region, say, of "c" to "3"? A. There seems to be an offset section at the end of the wrist pin bosses, shown in both Fig. 2 and Fig. 3.

Q. What will that produce? A. That will give a clearance at the end of the wrist pin.

Q. Referring now to Exhibit 1, one of Defendants' pistons, Mr. Richey has examined you about the web on the inside going from the wrist pin boss to the head of the piston. In what way does that web distinguish from the webs as employed in the Franquist piston prior to 1915? A. Well, this web seems to be the equivalent to moving the side of the trunk piston in on the wrist pin boss.

Q. No, I mean the web in a vertical plane extending across the head of the piston and down to the wrist pin bosses? A. Now, what was the question in regard to that?

Q. In what way does that compare with the web as used in pistons prior to 1915 about which you have testified? A. Oh, I should say a rib like that was employed at that time.

Q. In what way does it differentiate from the web shown in Heldt's book, deposition Exhibit M? A. The rib in Exhibit M is the same as that shown in Exhibit 1.

Q. How about the little webs or ribs on the outside of Exhibit 1, going from the head of the piston to the wrist pin boss, what is the purpose of that web or rib? A. That is to stiffen the wrist pin boss, help support it in the head.

Q. You said this Gulick piston, Exhibit 20, was flexible at both the top and bottom. What have you to say with reference to Exhibit 3-P, particularly assuming that the wrist pin is out of that piston? A. That is also flexible.

Q. Is it flexible even with the wrist pin in? A. Yes.

Q. Is that wrist pin in tight? A. Yes, very tight, tighter than actual practice.

Q. Why did you call Exhibit B a Van Bever piston? A. We didn't at the time it was made, but after we got into production, or some time while we were getting in production, we discovered that Van Bever had a patent, a man by the name of Van Bever had a patent on it.

Q. Did you ever pay him a royalty? A. No, we didn't, that I know of.

Q. Did you know about the Van Bever patent before you started in production of that Exhibit B? A. Well, perhaps before we started in production, but not while, the first part of the time we were doing experimental work on it.

Q. Did you know about the Van Bever patent or any Van Bever piston before you put those slots in Exhibit B? A. No, I didn't.

Q. On cross examination Mr. Richey examined you with reference to the Rainforth patent, and asked you the similarity of the Van Bever structure or Exhibit B, and I don't know just what you testified to as to that, but can you tell me whether or not the surrounding relief A with the slots extending in both reliefs, have any effect upon the Rainforth piston? A. I should say that relief was what made that piston workable. The slots extending into the relief allow the side walls shown at D to expand and contract against the cylinder walls.

Q. Now, I believe you also testified on cross examination that when such a piston as in the Rainforth patent is forced into a cylinder so that it will spring in, that upon heating of the piston it will get tighter in the cylinder? A. Yes, that is right.

Q. What have you to say about any slotted piston when it is put into the cylinder as a piston heats up? A. That will function, the piston expands and goes out against the cylinder wall, and the slots allow it to contract or to function against the cylinder wall without undue pressure.

Q. Is it your opinion, as you read the Rainforth patent, that Mr. Rainforth intended that these slots close when the piston is cold? A. No, I don't think they close when the piston is cold.

Q. Now, Mr. Richey cross examined you with reference to the Herschil-Spillman Company. Did you read The Horseless Age in 1914? A. Yes.

Mr. Bruninga: I mark for identification page 555 of the April 8, 1914, issue of The Horseless Age, as Defendants' Exhibit 4-M.

Q. Can you tell me whether you recognize it? A. I think likely I saw that Herschil piston—the Spillman piston described in that Horseless Age at that time.

Q. With reference to the Chenard & Walcker piston, will you tell me whether you ever heard of the Premier-Weidely engine of the Premier-Weidely car? A. Yes, I have heard of it.

Q. Do you know whether that automobile was in use in 1913 and '14? A. I couldn't testify as to the date of use, but I should say around about that time.

Q. Did you ever see the piston in that car? A. No, sir.

Mr. Bruninga: I want to have marked for identification as Defendants' Exhibit 4-N pages 1080 and 1081 of the December 24, 1913 issue of The Horseless Age; also as Defendants' Exhibit 4-O, pages 85 and 86 of the March 12, 1914 issue of The Automobile Engineer.

(Thereupon noon recess was taken.)

(Thereupon, at 1:30 P. M. the hearing was resumed.)

Q. Mr. Stellman, in discussing this piston valve, the French patent, I guess you remember what I referred to, those Serex patents, can you tell me whether those valves would be subject to any pressure, gas pressure? A. Yes, against the side walls of the valve, the gas explosion pressures would bear against the side walls of the valve.

Q. Is that the same pressure as the pressure that is applied to the power piston? A. It is.

Q. Now, in discussing the Ebbs patent, Mr. Richey examined you about, whether marine engines were in use in 1899, the engines being of the internal combustion type. My examination of you was with reference to the type of connecting-rod. Did you have anything else in mind when I examined you, except the difference between the locomotive type and the marine type connection? A. No; that is what I had in mind. I didn't even refer it to gasoline engines.

Q. Now, when you said that the Spillman & Mooers and the Chenard & Walcker structures were not flexible, what have you to say as to the Gulick patent structure, if

there is no slot in it? A. I should say that was a rigid construction without the slot.

Q. Well, I mean of course the vertical slots? A. Yes.

Q. How do the Spillman & Mooers and Chenard & Walcker and Gulick structures then compare, if none of them have that vertical slot? A. They are all rigid constructions without the vertical slot.

Q. You were cross examined with reference to Exhibit 3-H. Can you tell me in what respect that piston differs from cast iron pistons used as early as the beginning of 1915? A. One of the differences I had in mind was that this piston is not bushed in the wrist pin hole; while it was clearly common practice in 1915 to bush the wrist pin holes for the piston pin.

Q. How about the internal webs? A. This piston is of rather a lighter construction than was used in 1915 in general practice, I should think, and perhaps has more webs on that account.

Q. How about the reliefs? A. I should say those reliefs were in general use in 1915.

Q. How about the oil groove at the bottom of the ring lands? A. Oil grooves were used in 1915 similar to that shown in this piston.

Mr. Bruninga: That is all.

Re-Cross Examination by Mr. Richey.

Q. This Ebbs construction, you say, was for a marine engine? A. I said it had the marine type connecting-rod.

Q. That was for a steam engine, wasn't it? A. I don't know. I have forgotten what the patent said, if it said anything about that.

Q. Did you know that construction to be used on a gasoline engine? A. Not specifically, I couldn't say that I know of any.

Q. That is, I mean the construction with relation to the wrist pin that you said was of a marine construction. Did you ever know that to be used on a gasoline engine? A. I think it was used on gasoline engines; used in marine motors, too; I can't state any particular motor.

Q. You don't know of any case of your own knowledge? A. Not of my own knowledge.

The Master: The Ebbs patent says pistons for gas or other motors.

Mr. Richey: I am asking about the use of it. People say a lot of things.

Q. Now, you have pointed out the difference between the Ricardo and Jardine, in considering the construction shown in evidence at Figs. 6 and 7 of Jardine. There is also the difference that the Jardine webs are moved out and carried on the edge of the head, isn't that so? A. That is, as compared with the Ricardo construction?

Q. Yes; as shown in the Ricardo patent. A. Yes, those are moved out.

Q. Now, you spoke of running pistons and noting where they rubbed and then cutting that away, as being a practice that was employed to fit the piston to the cylinder. That practice you employed along in between 1915 and 1920, didn't you? A. Yes.

Q. And other engineers employed it, too? A. I would say so.

Q. And that practice was employed in an effort to get the aluminum trunk pistons to work in the cylinder without slapping and scoring? A. Yes.

Q. Now, you said that that would get down to the oval construction; that is correct, is it? A. I said it might.

Q. Well, notwithstanding that, in 1922 you filed an application for a patent upon an oval construction, didn't you? A. Yes.

Q. Well, I thought you said that in this cut and try business, or cut and rub off scheme that was employed back in 1915 to 1920, that that would result in an oval piston? A. I said it might result in an oval piston.

Q. Notwithstanding that, you, in 1922, made application for a patent on an oval piston? A. That is right.

Q. And at that time you of course made an oath that you considered yourself to be the inventor of this oval piston? A. Yes.

Q. You did that in view of the fact that you now claim that the rubbing and the cutting away would have resulted in an oval piston? A. I don't see that there is a crime about that, Mr. Richey.

Q. I don't say it is a crime. But as a matter of fact, that is reconciled by the fact that when you filed this application for a patent, you embodied in your claims more than the oval shape, didn't you? A. Yes.

Q. That is, it was combined with other features? A. Yes.

Q. Now, do you remember what other features? I show you a copy of your patent 1,557,625 that was issued from that application we have been talking about? A. I

think one of the features we had in mind was shown in lines 55 to 65.

Q. Just what was the feature? A. It says: "In operation the piston is placed in a cylinder with concentric portions of the pistons"—

Q. I don't mean to read it; just state what it was. A. It really covers the fact that the piston expands in the direction of the wrist pin and draws the piston in on the thrust surfaces.

Q. That is what you really did in that patent, was to claim the combination of elements of which the oval construction was one? A. Yes.

Q. And those elements themselves were old, weren't they? A. Perhaps so.

Q. And what you consider to be patentable in the piston was this combination of old elements which had been combined for the first time? A. I should think so.

Q. Then you do think that in this piston art the combination of old elements into a new combination is good enough to patent? A. I consider that that combination was.

Q. Now, you were asked about the meanings of words "flexible" and "rigidity" and things of that kind. As a matter of fact you, as an engineer, compare these pistons by what they do and how they do it rather than by the words somebody uses, don't you? A. Eventually, compare results.

Q. And that is the way you work in the engineering practice? A. Yes.

Q. And you were asked about this article by Mr. Gunn. There is a piston shown here marked—look at Fig. 3. That is a piston that had a liquid chamber around it, wasn't it? A. I don't know whether that was a liquid or just an air space.

Q. That is an aluminum piston in which they tried to solve the problem of putting some kind of cooling system in the piston? A. I should think so.

Q. That never made any progress, did it? A. Not that I know of.

Q. Do you know when that was tried out? A. No, sir.

Q. Over on the next page, Fig. 5, is that piston a Zephyr piston? A. Essentially I should say.

Q. That was what you tried out at the Franklin Company and didn't get anywhere? A. Yes.

Q. Take Fig. 7 of this Gunn article of Exhibit 4-G. That piston shown in Fig. 7 is of the general construction as shown in Exhibit 24, isn't it? A. Yes, I should say it was.

Q. And as far as you know, that piston was not successful? A. No.

Q. You don't know when it was first tried out? A. No, sir.

Q. Now, look at the piston shown in Fig. 8. That differs from the so-called Long piston shown in, for instance, Exhibit E, in that on one side the boss is cut away from the web; that is correct, isn't it? A. Yes.

Q. So that is not the Long piston as you used it? A. No, sir.

Q. Do you know whether the Long piston was ever tried out like that, or rather such a piston as shown in Fig. 8 was ever tried out? A. I don't think we tried it, Mr. Richey.

Q. You don't know whether it was tried out or not. Now, take the one shown in Fig. 11 of this article: that has got some kind of insulating material in the top? A. I should judge so.

Q. Mineral wool, or something of that kind? A. Yes.

Q. Do you know if that system was ever tried out? A. No.

Q. This never came into use, did it? A. No.

Q. So far as you know, a piston like that shown in Fig. 8 never came into use? A. Not just in that form.

Mr. Bruninga: Are you going to give the court a copy of this Stellman patent 1,557,625?

Mr. Richey: You give him a copy.

Mr. Bruninga: Of course I want to offer that in evidence with the other patents, not as a new exhibit. I offer it in evidence in the book form.

Q. Mr. Stellman, the main function of the piston is to transmit power, isn't that correct? A. Yes, and to seal the explosion gases.

Q. Well, it has got to transmit power, whether it seals or not. The primary function is transmission of power? A. I should say so.

Q. That is pretty onerous work, transmitting that power from the explosion to the connecting-rod, isn't it? A. I should judge so by the amount of work it does.

Q. It puts a heavy burden on the piston? A. Yes.

Q. And the prime consideration is that the piston shall transmit that power and do that rough work without going to pieces or breaking up in the cylinder? A. that is right.

Q. What is the force of the blows on the top of the piston? A. Why, I should say there is a pressure there as high, in 1920, as high as 350 pounds per square inch.

Q. And how often did that blow come on the piston? A. Once every other revolution of the engine.

Q. How many revolutions per minute, would you say, in 1920? A. Oh, say they ran 24 to 26 hundred revolutions per minute.

Q. How many blows per minute would that be, roughly? A. That would be twelve or thirteen hundred blows per minute.

Q. And the direction of the piston was reversed how many times per minute under those circumstances? A. Twice every revolution.

Q. Now, that blow tends not only to drive the piston down but to drive it over against one wall, doesn't it? A. Yes.

Q. One wall of the cylinder. So when you consider giving a piston flexibility, lightening it and controlling the heat in it, all the time you have got to keep in mind that the first consideration is that the piston shall stand the blows and do this work; that is correct, isn't it? A. That is right.

Q. And any combination that you form of a piston that would result in flexibility and the accomplishment of these other features, has got to take into consideration first that it does that work and withstands those blows? A. That is right.

Q. And if you, in trying to make a piston flexible or make it transmit heat in the proper way, or lighten it, you sacrifice that first consideration, that is, doing the work, why, your piston would not be of any practical importance, would it? A. That is right.

Q. Now, with a racing car the supreme consideration is development of power, isn't it? A. Yes.

Q. And as far as preventing slap and those things, that is all of negligible consideration, isn't it? A. To a degree, yes.

Q. Now, isn't it a fact that the racing car drivers have never used these split skirt pistons as far as you know? A. I don't know of a case right off hand where they used split skirt pistons, except this one that has been used.

Q. Well, except what you have heard about this Monckmeier piston? A. Yes.

Q. But except for that, you have not known of any racing driver ever using split skirt pistons? A. No; but I will have to admit that my experience with racing pistons has not been very great.

Q. Well, as far as your knowledge goes, you don't know of any? A. That is right.

Q. These racing car drivers are at all times experimenting with their apparatus, trying this and trying that, to get another mile of speed out of it, aren't they? A. I judge so.

Q. And that has been your observation? A. Yes.

Q. They are at all times trying something and then going on to something else? A. They work all the time over their cars to get them better and better.

Q. And since aluminum pistons have come in, the racing car drivers haven't used them split to your knowledge? A. Not to my knowledge.

Mr. Richey: That is all.

Re-Direct Examination by Mr. Bruninga.

Q. Just one question: Mr. Richey has talked about the pressure blow on a piston, on a working piston in an engine. Can you tell me whether or not that same pressure blow also comes in a piston valve in that same engine? A. Yes, the same pressures as act on the valve act on the head of the piston.

Mr. Bruninga: That is all.

(At this point the testimony of D'Vorsky, Record pages 328 to 343 was taken.)

Mr. Bruninga: I offer in evidence Defendants' Exhibit CCC, which is a piston; EEE, section of Spillman & Mooers; FFF, Long piston; 3-G, cross section of Exhibit 1; 3-H, a cast iron piston; 3-I, a clamping device; 3-J, the Ford piston; 3-K, the Silv-O-Lite Piston; 3-L, circular of Silv-O-Lite; 3-O, another piston; 3-P, split Spillman & Mooers; 3-Q, Franquist piston; 3-R, half-section Gulick piston; 3-S, the Automobile Engineer of October, 1918; 3-T, complete Gulick piston; 3-U, photostat of letter from McCoy to Harness; 3-V, Monckmeier cast iron piston; 3-W Monckmeier aluminum piston; 3-V', Kant Skore piston; 4-A, diagram produced by Stellman; 4-B, photostat produced by Stellman; Ebbs patent with locomotive connection.

Mr. Richey: We object to that as immaterial.

Mr. Bruninga: 4-G, the Gumm article; 4-H, book of patents; 4-I, royalty report with drawing attached; 4-J, photostat of March 12, 1914, issue of The Automobile; 4-K, The Automobile, issue of March 5, 1914; 4-L, Gulick File Wrapper and contents; 4-M, photostat The Horseless Age, April 8, 1914; 4-N, The Horseless Age, page 1061, December 24, 1913 issue; 4-O, photostat The Automobile Journal, March 12, 1914; 4-P, a postal card, Monckmeier automobile; 4-Q, sketch produced by D'Vorsky; 4-R, photostat, Anamosa Journal. With reference to this Automobile Engineer, Defendants' Exhibit 4-S, the Automobile Engineer of October, 1918, I would like to substitute photostat of pages 274, 5, 6, 7 and 8, in order not to make the record so bulky.

The Master: It will be so ordered.

Mr. Richey: We agree to that. We will repeat our objections to these exhibits made during the taking of the testimony, except as to such as were not set up in the answer, because they weren't set up in the answer, and to get the thing behind me, I will offer this piston which was offered for identification as Defendants' Exhibit AAA, as Plaintiffs' Exhibit 41.

Mr. Bruninga: As 4-L1, File Wrapper and contents of Mooers patent in suit; 4-L2, File Wrapper and contents of the Jardine patent in suit; 4-L3, File Wrapper and contents of the Schmiedeknecht patent in suit; 4-L4, File Wrapper and contents of Maynard patent in suit; 5-C, page 250, December 28, 1921 issue of Motor World.

Mr. Richey: That has not been up before, has it?

Mr. Bruninga: No.

Mr. Richey: All right; I think it is immaterial.

Mr. Bruninga: 5-D, photostat of page 133 Automobile Trade Journal, cited by the Patent Office.

Mr. Richey: That has a date on here April, 1916. What makes you think that is the right date?

Mr. Bruninga: I got it from the Patent Office. We can check that up very easily.

Mr. Richey: Well, subject to correction, I make the objection.

Mr. Bruninga: 5-E, photostat, page 504 of the Automobile Engineer of December, 1920.

Mr. Richey: On all of these publications I object to the statements of fact in there as hearsay.

Mr. Bruninga: 5-F1, photostat of pages 3 and 5, Motor Age, of August 24, 1911.

Mr. Richey: I object to it as immaterial. Not properly identified; and the facts in it are hearsay and not set up in the answer.

Mr. Bruninga: You know we have a stipulation about photostats of publications?

Mr. Richey: Not that an immaterial one shall become material.

Mr. Bruninga: 5-F2, Motor Age, August 31, 1911, photostat of pages 10, 12, and 15.

Mr. Richey: Same objection.

The Master: Same ruling.

Mr. Bruninga: 5-F3, photostat The Automobile, October 12, 1911, page 643.

Mr. Richey: I make the same objection to this.

Mr. Bruninga: 5-F4, Motor Age, October 12, 1911, photostat page 10.

Mr. Richey: Same objection.

Mr. Bruninga: 5-F-5, The Automobile, October 12, 1911, photostat page 687.

Mr. Richey: Same objection.

Mr. Bruninga: 5F-6, The Automoble, November 16, 1911, page 853.

Mr. Richey: Same objection.

Mr. Bruninga: 5F-7, Motor Age, November 16, 1911, page 15.

Mr. Richey: Same objection.

Mr. Bruninga: 5F-8, Motor Age, December 14, 1911, pages 4 and 7.

Mr. Richey: Same objection.

Mr. Bruninga: 5F-9, Motor Age, October 16, 1913, photostat page 21.

Mr. Richey: Same objection.

Mr. Bruninga: 5F-10, Motor Age, December 4, 1913, page 24.

Mr. Richey: I make the same objection.

Mr. Bruninga: 5F-11, photograph the Peoria Star, September 27, 1913, one page.

Mr. Richey: Same objection.

Mr. Bruninga: 5F-12, photograph page Peoria Star, July 5, 1914.

Mr. Richey: Same objection.

Mr. Bruninga: 5G, certified copy of the incorporation papers of Staver Motor Car Company.

Mr. Richey: What is the purpose of putting in these 5F-1 to 5F-12?

Mr. Bruninga: To support Mr. Monckmeier, showing the dates of those races by publication.

Mr. Richey: In other words, you intend to rely upon the statements in these publications that there were races on those dates?

Mr. Bruninga: Oh, I want to support Mr. Monckmeier's statement that there were races and that he was in races on those dates.

Mr. Richey: And you depend on these papers because they say they were?

Mr. Bruninga: No; I depend on Mr. Monckmeier also.

Mr. Richey: I object to all this as immaterial, and move that it be stricken out. He is just relying on the statements in the papers and publications that there were races on those dates, and there are a dozen—

The Master: Same ruling; they are in. I will receive them.

Mr. Bruninga: 5-G, certificate from the Secretary of State of Illinois with reference to Staver Motor Car Company. 5H-1, photostat, decision Law Examiner in Interference Hartog versus Pomeroy, 45,351.

Mr. Richey: I object to this 5H-1 as immaterial. It doesn't relate to any of the patents in suit, and relates probably to the Hartog and Pomeroy patents, or one of them, and they were brought in here without any pleading in the answer with respect to them.

Mr. Bruninga: Does your Honor want to hear from me at all?

The Master: I think not. I will receive it over the objection, and you may have an exception.

Mr. Richey: I am going to object to this decision further on the ground that it is not accompanied by the motion and pleadings to which it relates and contains certain statements of fact that were apparently adopted from those pleadings, that would be incompetent as secondary.

The Master: Same ruling.

Mr. Bruninga: 5H-2, copy of decision of Examiner of Interferences in the Hartog-Pomeroy interference. 5H-3, copy of the decision of the Board of Appeals in that interference.

Mr. Richey: I make the same objection.

The Master: Same ruling. Is this the same case as is reported in the 42 F. (2d)?

Mr. Richey: No; those don't even relate to the patents in suit. A typical illustration of lumbering the record up with a lot of immaterial stuff.

Mr. Bruninga: You know what I am going to put these in for.

Mr. Richey: Oh, you have some nebulous theories about the thing.

The Master: Well, we will receive them, and consider the theories when they are advanced.

Mr. Bruninga: Now, I would like to substitute for the books of account Exhibit V-1 to V-7, the deposition exhibits, photostats of pertinent pages that we have quoted from, and I have the exhibits here and I will produce them in court, but I believe counsel will agree I can substitute photostats for the pertinent pages that counsel for plaintiff has had, and then they can examine the books at any time.

Mr. Richey: What pages, so that we can check the pages?

Mr. Bruninga: The pages were given to Mr. McCoy.

The Master: The pages were referred to in the testimony.

Mr. McCoy: Just as referred to in the testimony; is that the understanding?

Mr. Bruninga: Yes, those that we have submitted here copies of.

Mr. McCoy: Oh, yes, in the deposition testimony, except they are objected to as immaterial and irrelevant to any matter before the court.

The Master: Same ruling; they may stand.

Mr. Bruninga: 5-I. I also want to offer in evidence a copy of the bill of complaint in the case of The Cleveland Trust Company and the Chrysler Corporation versus The Simmons Manufacturing Company, Equity No. 3510, Sterling Corporation being also named as party-defendant, in the District Court of the United States for the Eastern Division of the Northern District of Ohio.

Mr. Richey: Is that the only thing you have, left?

Mr. Bruninga: Those are the only exhibits I have left. There will also be a letter from Anna Landon Duke, who kept the record books V-1 and

V-7, and counsel seems to be satisfied with the lady's letter, and I will offer that in evidence as Defendants' Exhibit 5-J.

There is one witness, your Honor, of whom I would like to take his deposition, and possibly some one to support him. I just got in touch with him lately and he lives in Ironwood, Michigan. I may be able to get him down as far as Chicago; but he doesn't want to come here. Now, the man's name is Schoengarth, and it comes up in connection with that Schoengarth patent 1,174,002. Now, it is not the usual case where I might have taken his deposition beforehand. There was a motion for further particulars in each of these cases, and the particular construction which was relied upon as an infringement was Exhibit 1. During the time that Dr. Jeffries testified, the patents were expanded and expanded until now they seemingly cover, according to plaintiffs' contention, a structure like Exhibit CCC. Our contention is that that CCC is practically the same as that illustrated in the Schoengarth patent, and we want to take his deposition as to the use of that structure. During the prosecution of the application of the Gulick patent, this patent was cited, and together with a number of others, then an affidavit was filed by Gulick going back of, way back to 1914. Now, that was sufficient for the patent; but there is another question involved here, and that is whether perhaps Mr. Schoengarth had this thing in public use more than two years prior to the filing date of the Gulick application, which is November, 1915, and of course that matter was not investigated by the Patent Office at all. I am informed that he did have it in public use more than two years before the filing of the Gulick application, and that becomes pertinent in this case now on account of plaintiffs' position that the Gulick patent is broad enough to cover a structure like Exhibit CCC. The question is not one of validity of the patent so much as it is the question of whether, first, Gulick could expand his claims to an extent sufficient to cover a structure like that, and, second, whether this court will expand the claims sufficiently broad to cover a structure already in the prior art and barred by the two years' use.

Right after the position taken by counsel in this case, I proceeded to investigate the matter further,

and I got in touch, finally got in touch with Mr. Schoengarth by long distance telephone, had a number of conversations with him, and I understand from him, that he actually had this in use, and I believe we are entitled to take the deposition of Mr. Schoengarth and one or two additional witnesses right in that vicinity, that he thinks he has there.

The Master: Is there any objection to this?

Mr. Richey: Yes, sir; our position is, in the first place, the order for the Master does not authorize the master to grant leave to take depositions at this stage of the proceeding. If your Honor will remember, there is a statute that provides for the taking of depositions in the federal courts, and as I remember the statutes, they allow the taking of depositions between the joinder of issue and the trial. The Supreme Court has announced a certain rule setting times for taking depositions, and authorizing the courts to grant leave to take depositions outside of the rule. So I think my Brother must go to the court. Beyond that there was a stipulation entered into in each of these cases between the parties that depositions might be taken until fifteen days before the cause was to be set for hearing. Now, as far as the presence of Exhibits BBB, CCC, and JJJ are concerned in this case, they have been interjected by the other side. This Schoengarth patent, though long known, has not been pleaded in the answer. There is no excuse for the delay, therefore, and his statement of what he intends to prove would not establish a public use in view of the Barbed Wire Case and other cases.

(Thereupon further argument was had.)

The Master: My judgment would be that the defendants would be entitled to take that testimony, if they cannot get that witness here.

Mr. Richey: Well, is your case completed, except for that?

Mr. Bruninga: My case is closed except for that.

Mr. Richey: Can you give us the names of the witnesses now?

Mr. Bruninga: I can give you Mr. Schoengarth's. I have those names on my tab at the hotel.

Mr. Richey: It all relates to that one thing?

Mr. Bruninga: It all relates to that one thing.

They are all around Ironwood, and the order will be limited to those.

Mr. Richey: Then we will have the right to take any depositions to answer it?

The Master: Oh, yes, certainly.

Mr. Richey: I presume your Honor grants an exception to your ruling?

The Master: Oh, certainly.

Mr. Richey: We will reserve the right to move to strike the depositions out.

The Master: Yes, you may have the right.

Mr. Richey: Now about the expense of taking these depositions. Is your Honor going to make any order about that? Do we have to go to the expense under the circumstances?

Mr. Bruninga: I went to the expense myself to take all those depositions.

Mr. Richey: Considering the fact that he is making this application at this late date—

The Master: I cannot make any order except such as is subject to the final order of the court, and any cost of depositions may be taxed as costs of the case, to be finally determined by the order of the decree.

Mr. Richey: All right; I guess we are ready to proceed.

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Supreme Court of the United States

OCTOBER TERM, 1938

No. 3

THE SCHRIBER-SCHROTH COMPANY, PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 4

THE ABERDEEN MOTOR SUPPLY COMPANY, PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 5

THE F. E. ROWE SALES COMPANY, PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

ON WRITS OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT.

PETITION FOR CERTIORARI FILED JANUARY 7, 1938.

CERTIORARI GRANTED MAY 31, 1938.

United States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,

vs.

THE SCHRADER-SCHROTH COMPANY,
Defendant-Appellee.

No. 4045.
EQUITY.

7223

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,

vs.

THE ABERDEEN MOTOR SUPPLY COMPANY,
Defendant-Appellee.

No. 4046.
EQUITY.

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THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,

vs.

THE F. E. ROWE-SALES COMPANY,
Defendant-Appellee.

No. 4047.
EQUITY.

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FOR THE NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION.

TRANSCRIPT OF RECORD

VOLUME III.

Rebuttal and Surrebuttal Testimony, Papers Subsequent to Trial and Appeal Papers.

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OCT 9 - 1935
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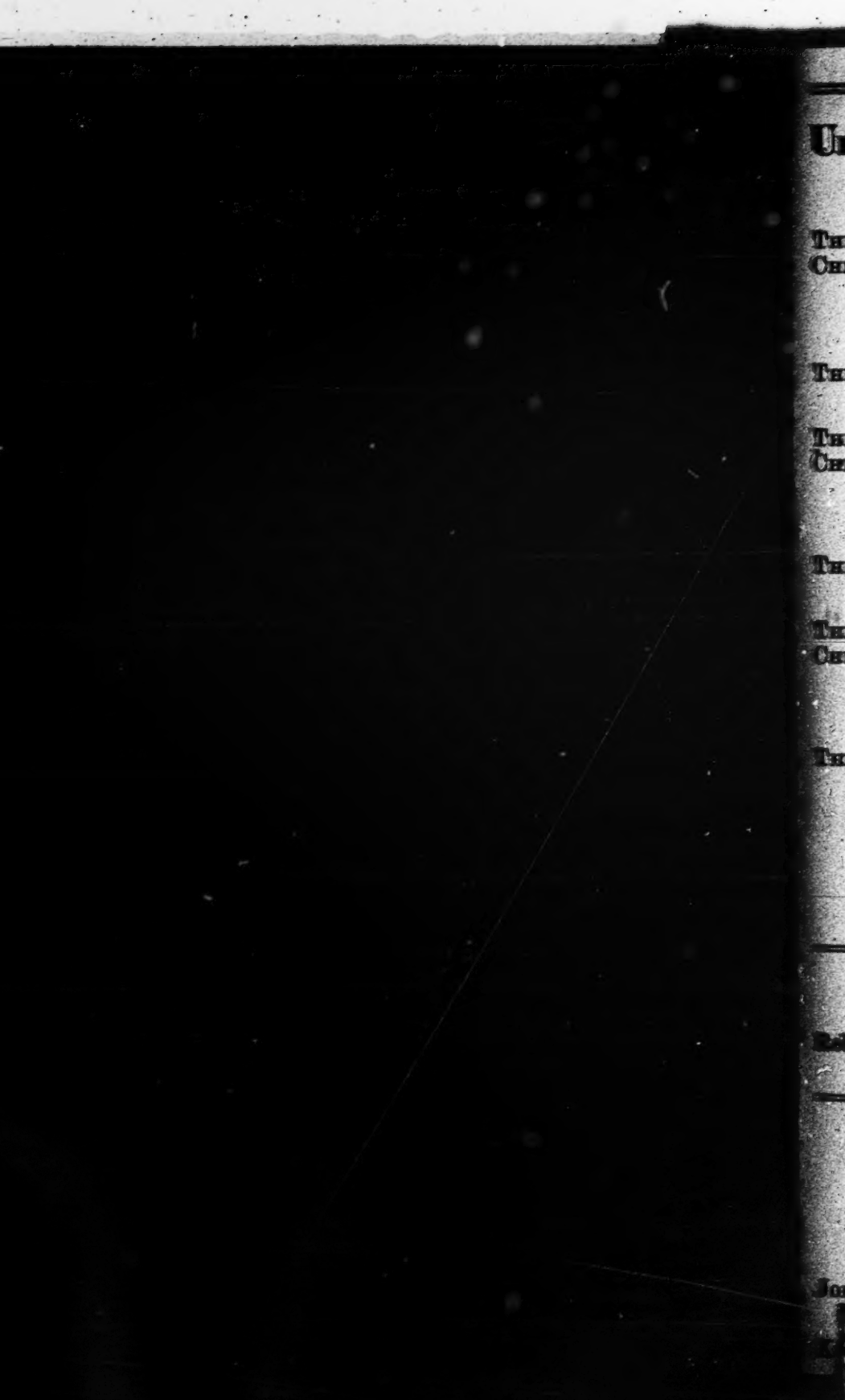

nited States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

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E Cleveland Trust Company, eysler Corporation, *Plaintiffs-Appellants,* vs. E Aberdeen Motor Supply Company, *Defendant-Appellee.*	No. 4046. Equity.
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The District Court of the United States,
For the Northern District of Ohio,
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buttal and Sur-rebuttal Testimony, Papers Subsequent to Trial and Appeal Papers.

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3.	U. S. Patent No. 1,763,523, June 10, 1930, to F. Jardine (Patent in Suit)	51	1291
4.	U. S. Patent No. 1,655,968, Jan. 10, 1928, to H. E. Maynard (Patent in Suit)	51	1299
5.	U. S. Patent No. 1,256,265, Feb. 12, 1918, to V. E. Schmiedeknecht (Patent in Suit)	51	1305
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23.	Large Drawing of Ray Day Pistons	190	W
24.	Double-Walled Aluminum Piston	258	W
25.	Consent Decree, Simmons Case	264	1341
26.	Conveyance, Declaration of Trust and Agreement between L. P. Mooers and George B. Pitts and The Cleveland Trust Co., dated March 7, 1922	265	1345
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28.	Bill of Sale, Amplex to Gulick	608, 617	1358
29.	Sketch by Randall of Gulick Piston	617	1359
30.	Series of Blueprints of Gulick Motor	617	W
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CC(1).	Blueprint D-793X of The Aluminum Castings Co. (Drawing of proposed design of piston for H. H. Franklin Mfg. Co.)	466	1633
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BBB.	Piston, Six Cylinder Chevrolet	55	W
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3-V.	Monckmeier Cas. Iron Split Skirt Piston	590	W
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4-G.	Pages 362, 363 and 364 of "Automotive Industries" for Jan. 29, 1920	537, 591	1667
4-H.	Prior Art Patents	539, 591	....

U. S. PATENTS:

No. 700,309	May 20, 1902	H. E. Ebbs	1671
No. 908,569	Jan. 5, 1909	F. D. Howe	1675
No. 1,031,212	Jul. 2, 1912	E. Van Bever	1679
No. 1,092,870	Apr. 14, 1914	E. O. Spillman and L. P. Mooers	1683
No. 1,153,902	Sept. 21, 1915	G. E. Franquist	1687
No. 1,174,092	Mar. 7, 1916	W. L. Schoengarth	1693
No. 1,195,936	Aug. 22, 1916	C. White	1699

* Exhibit 3-Z is erroneously referred to in the Narrative, at page 472, as Exhibit 3-Y.

No. 1,229,540	June 12, 1917	E. O. Spillman	1703
No. 1,279,184	Sept. 17, 1918	J. G. Vincent	1707
No. 1,283,021	Oct. 29, 1918	C. C. Anderson	1713
No. 1,294,833	Feb. 18, 1919	H. R. Ricardo	1717
No. 1,325,176	Dec. 16, 1919	A. Spillman	1723
No. 1,395,441	Nov. 1, 1921	E. C. Long	1727
No. 1,489,499	Apr. 8, 1924	E. C. Long	1731
No. 1,872,772	Aug. 23, 1932	E. C. Long	1735

British Patents:

No. 19,559 of 1890	James Roots	1739
No. 17,256 of 1907	John Vernon Pugh	1743
No. 6,826 of 1912	William Frederick Rainforth	1751
No. 12,772 of 1914	Samuel Octavius Ferry	1755
Specification 140,988	Ernest Walter Hives	1759

French Patents:

No. 468,595 of 1914	Chenard and Walcker	1763
	(Translation of foregoing)	1767
No. 434,147 of 1911	M. Chas.-Emile Serex	1769
	(Translation of foregoing)	1773
No. 16,362 of 1912	M. Chas.-Emile Serex	1777
	(Translation of foregoing)	1781

German Patent:

No. 176,988 of 1906	Otto Lietzenmayer	1785

Additional U. S. Patents:

No. 1,557,625	Oct. 20, 1925	L. M. Stellmann	1789
No. 1,842,022	Jan. 19, 1932	S. D. Hartog	1797
No. 1,499,073	June 24, 1924	L. H. Pomeroy	1803

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4-V.	Same as Plaintiffs' Exhibit 40.....	287	1435
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5-B.	Option Agreement of October 13, 1930 in the above (Formal Offer not included in Narrative)	...	W
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	5-F_1 to 5-F_6	592	2277
	5-F_7 to 5-F_{12}	592	2278
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5-K_3.	Three pages Description by Schoengarth of "The Adjustable Gas Engine Piston"	899	2309
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5-K_5.	Letter dated May 22, 1915 from W. L. Schoengarth to Louis Bagger & Co.....	899	2311
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5-K_{10}.	Schoengarth Piston	907	W
5-K_{11}.	Letter dated April 2, 1917 from Louis Bagger & Co. to Walter Schoengarth....	907	2325
5-K_{12}.	Envelope sent to Schoengarth at Cleveland	912	2327
5-L.	Franquist Piston Construction.....	1051	W
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CASE NO. 4046.

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Certificate of Clerk 2357

[illegible] ..... [illegible]

REBUTTAL TESTIMONY.

Thereupon Plaintiffs called as a witness in rebuttal ALISLE W. ROCKHOFF who, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Alisle William Rockhoff. I live at 8335 Cloverlawn, Detroit. My age is 36. I am at present Foreman at the Burroughs Adding Machine, Detroit.

I knew Edward J. Gulick while he was connected with the Amplex Motor Company—I am not sure of the name "Amplex"; it might have been American Simplex; the name was changed so many times, I am not sure of the name of that company. That was about 1912 to 1914, along in that period. My recollection is not clear on this date. I worked in my dad's foundry at the time I knew Mr. Gulick, which was the American Castings Foundry, located across the street from the Amplex. My father's name is William.

That foundry specialized in motor castings and did a little vacuum-sweeper work. They worked only in aluminum. They made castings for the Amplex Motor Company, and for Mr. Gulick. Other than pistons I don't recall any particular castings for Mr. Gulick. We made these castings for Mr. Gulick in the period between '12 and '14; I rather think it was the latter part of '13; I can't definitely tell that. I saw these castings in my dad's foundry. I know they were made for Mr. Gulick because at the time he took a personal interest in that particular work, and he very seldom came over to the foundry, and I remember him over there at the time that these castings were made, examining them. I recall them more at the time after they were machined, that he had them rough-turned, and they were declared defective because of pores or porous castings, I think that is what they called them. I did not see them being machined, but I saw them before and after they were machined. The last time I saw them they were on a little work bank out in the foundry.

I have one recollection of these castings; they were flat top, and there was nothing unusual in the size of them; just an ordinary piston, no concave work on the outside, just the cylinder, as I recall it. The castings were like an aluminum cylinder, approximately 3" in diameter, 4" long, rough-turned, and a flat top. I don't

remember anything else about them. I don't recall that Mr. Gulick ever got other than piston castings from my father's foundry.

Mr. McCoy: Direct closed.

Cross Examination by Mr. Bruninga.

I finished high school at the age of 18; and it was, I should judge, three years previous that I saw those castings; so I must have been between 14 and 16; it may have been but one year previous. I connect up the period with the time that father closed the foundry, and that date is the beginning of 1915. I connect that with my graduation in the year 1915. I think it was in the year 1915 that I graduated, but it was previous to that that I saw this casting. I don't know definitely how much previously, but it was between '12 and '15. I am testifying from memory, and connecting the dates with my high school and closing the foundry.

It is not fiction in my mind as to the happenings; very definite; that part is not a fiction, because I was acquainted with everybody concerned.

Originally the Amplex company was the American Simplex Motor for a short time, and changed to the Amplex Motor Car Company, and then changed to the Amplex Auto & Machine Company, and then to the Gillette Motor Company, and they changed it so often in the short period that I don't know which one it was. That company was in Mishawaka, Indiana. My father's foundry was either just on the edge of the city limits of Mishawaka or right in the city limits, but it was located either on the boundary of the city limits or just inside of the city limits. It was country outside of the city limits.

I testified previously for Mr. Gulick in an interference proceeding before the Patent Office.

These two places were right across the street from each other; it was the main highway out of the city, and one on one side and one on the other.

I worked in my father's foundry during vacations, and I also worked there spare time, when called upon, on Saturdays. I saw Mr. Gulick around there off and on, but not a great deal. I don't know whether he was there during the entire four years; I don't know whether he was there that long or not, because I didn't see him the four years continually there. I would say he was around there the first or second year. I would feel that the years

'13 and '14 would be when he was there. He was there a good deal, as I recall it.

The name of my father's company was The American Castings Company. They referred to it by the name of the Rockhoff Foundry because he was the owner of it.

This order of Mr. Gulick's which I have been talking about was defective, and they had to replace them. There was one particular batch of castings I had in my mind. I remember other batches of castings that looked like piston castings, I have seen them in the foundry. I have seen piston castings in the foundry from other people, at the time I attended high school. Amplex did cast iron casting and they never had any there. These were aluminum piston castings. There was more than one batch of piston castings made for Mr. Gulick. I say we replaced the defective batch and another batch; previous, I don't remember. I think that was the first batch, when they were found defective, they had to be replaced.

My father was in active control of that business during the period I have been talking about. He is 71 now, so I should judge he was 58 at that time. He was active; the foundry employed 25, 30 men, and he worked right out with the men, supervised the work. The orders were given to my father. If there was any trouble about defective castings, I should judge he would look at them pretty closely; that was his practice.

In those days we machined aluminum castings a rough turn to see whether they were defective. After the machining, the porous holes, sand and blow holes, would show up, where they wouldn't if you didn't machine them. Where castings were defective, they would be brought back in the machined condition, and I associated the fact that these were machined by the fact that they were returned. A good deal enters into that.

I would consider my father's statement as to what these castings were, pretty accurate, in other words, if my father made a statement as to how these castings were constructed, I would take his word for it rather than my own memory. I remember pretty distinctly that I graduated from high school in 1915. My father's age then was about 50, and he was an active man. His age was fifty some in 1913. I am now 36.

R. W. RANDALL, a witness called by Plaintiffs in rebuttal, and first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is R. W. Randall; age 51; and reside at Milwaukee, R.F.D. No. 9, Station F. My present occupation is sales manager, Briggs & Stratton Corporation. Since 1911 I have been connected with the automobile manufacturing industry, manufacturing motors, motor parts, automobile parts, and at present manufacturing gasoline motors.

I know Edward J. Gulick. I first met him in 1912, I think it was, at Mishawaka. I am not sure what Mr. Gulick's occupation was at that time, but I think he was connected with the Excelsior Motor Company in Chicago. He happened to be in Mishawaka, and he was formerly with the Simplex Motor Car Company; and he came out to the plant. I was there. At that time it was the Amplex; and I introduced myself.

The Simplex plant was located in Mishawaka on the Lake Shore tracks, at Beaver Street, I believe it was. That was in Indiana.

My position at the Amplex Company was general manager. I occupied that position from 1911 until 1914. I think the company changed names in the meantime. Originally it was the Amplex Motor Car Company, and I believe through receivership it passed into the Amplex Manufacturing Company. The receivership was in 1913 or 1914; I don't recall the date.

There was a change in the management of the company at that time. At the time the Amplex Manufacturing Company took it over, it was purchased by Mr. Pulcifer; Mr. Gulick came to Mishawaka at that time as secretary of the company. That was in the early part of 1914, the late spring. Mr. Gulick's position at the plant was secretary of the company and chief engineer. I don't know just when Mr. Gulick did leave that company, because I left before he did. At the time Mr. Gulick came with the Amplex Motor Company, we were manufacturing motors and motor cars. The motor was a four-cylinder, two-cycle motor, and the car was the conventional type of automobile being built at that time, known as the Amplex car.

We changed the construction of the Amplex car; the car in general was much the same, but the motor construction was changed from a two-cycle motor or four-

cylinder, two-cycle motor, to a six-cylinder, four-cycle motor. We bought that motor from the Buda Company at Harvey, Illinois. This change from four-cylinder to the six-cylinder Buda motor was in 1914. Mr. Gulick made the suggestion of this change in this way: he had designed a six cylinder motor, drawings of which he brought over with him; it was a little different type of motor than had been built up to that time. It was a sleeve valve motor. In order to get changed over quickly and get some money coming into the plant, we decided to put in this Buda motor until such time as we could get the Gulick motor, which was a sleeve valve motor, coming through.

Mr. Gulick talked to me about his motor design. He didn't have complete drawings. He had a general, you might say an assembly drawing, showing the idea and the principle of it; and we were working up the details of the job for production. The sleeve construction was discussed between us, to quite some extent and materials used were discussed, and in that discussion we brought out the question of clearance and improvements of design, and this aluminum piston construction.

The aluminum piston construction that was talked about at that time was a slit skirt type of piston, and the bosses were carried to the top or head of the piston—weren't connected to the sides of the piston. There was a slot running around the piston so as to take care of the expansion of the lower skirt of the piston.

The slot running around the piston was just below what we call the wiper ring section of the piston, or the lower ring. The slot went through the wall and carried completely around the piston. That slot separated the skirt from the ring or head-carrying section of the piston. The skirt was carried through a section of the side wall, as I remember it. There was a section about ¾" wide at the pins. It has been quite some time since I saw it; my memory isn't quite clear on that exact detail; but there was a diagonal slot in the skirt of the piston that ran to the extreme end, and the slot running around the piston. The slot extending diagonally of the piston skirt, ran pretty close to the groove, I would say. That is, the lower ring groove, the first groove above the wrist pin hole. The diagonal slot ran almost to or cut into the slot that ran around the piston skirt; I wouldn't be sure, my recollection is not clear on that point.

There were some pistons made up, not exactly to that construction. We had previous to Mr. Gulick's connec-

tion with our company, done some experimental work on a six-cylinder sleeve valve motor, and in this motor we used aluminum pistons. They were the conventional type, and we had trouble with them. When this question came up of Mr. Gulick's design, I talked to him about this piston, having in mind the trouble we had experienced on the previous type; and our troubles were that the piston would seize if we had it tight enough so it wouldn't slap; if we got it so it wouldn't seize, it slapped. I remember making the remark at the time that that was the very thing we were trying to kill; with this idea, you would get a piston that would fit tight and still not have it seize. We took the patterns that those original pistons were made from,—it happened to be pretty close to the size Gulick had,—and made up some sample pistons to prove the theory, and put them into this Buda motor. Now, that piston was slotted in a very similar manner to what he had in mind, but the wrist pin bosses weren't anchored to the top of the piston, as he had originally designed it. There were some slight changes made in the core box, and the pattern itself required a little lagging, but the core box was changed so as to strengthen up the rib construction on the wrist pin bosses. And that is the piston that we eventually tested in this Buda motor.

Mr. Gulick's general drawing of his motor was turned over to our engineering department, which at that time was in charge of Mr. Frank Winchester, and he started working out the details for manufacture, with other draftsmen that we had in there in our engineering department. There was a young man by the name of Rockhoff, who was a draftsman there at that time. I don't remember his first name. His father operated a foundry across the road. That is why the thing comes to my mind. He was just a lad at the time.

The job of designing that motor was directly under Mr. Gulick, Winchester was the chief engineer so far as the drafting room was concerned, and prior to Mr. Gulick's connection with our company was our engineer. When Mr. Gulick came in he was recognized as the engineer of the company. He was in very close contact with the work on those drawings. Those drawings were never finished in detail. There were some parts finished. I believe some patterns started on some of the parts, but they were never finished while I was there. I believe I could recognize those drawings.

Mr. Bruninga: Before the witness looks at those drawings, I believe it is incumbent upon you, Mr. McCoy, to have him at least sketch what he saw, rather than simply rely upon the rough drawings, unless you only intend to identify what those drawings show, and then ask him about what he saw, later on in the course of the examination.

(Narrative continued) I was in the drafting room occasionally. My position there of necessity brought me in contact with those drawings. I actually saw Mr. Winchester, Mr. Rockhoff and Mr. Gulick working over those drawings. I saw a tracing made of the general assembly. I can't recall any definite parts.

Mr. Winchester's full name was Frank U.

There really wasn't any name put on that motor in our plant. The drawings that Mr. Gulick brought over from Chicago just bore the signature "E.J.G. Motor." Those initials indicated Mr. Gulick's name, I presume. It is not customary to name a motor in a manufacturing plant until after it is born and something done with it.

The castings for the manufacture of that piston were made at the aluminum foundry right across the road from the Amplex plant, operated by a Mr. Rockhoff, I don't recall his full name. That foundry was located directly across the road, on the New York Central Lines, from the Amplex Motor Company. I saw the castings in our plant. They were machined in our tool room by a fellow by the name of Johnson, I think, was the foreman of the tool room at that time. I saw the castings after the machining was completed. I think there were some seven or eight castings altogether and a set of six of them completed up for this motor. Those completed pistons were made up with a groove construction, had the rings the same as the conventional type piston; the skirt was split from the lower ring groove down to the end of the skirt, split through. There was a slot cut around the piston on either side extending from the wrist pin boss to the wrist pin boss. There was a slot entirely surrounding, but it wasn't a continuous slot. The slot was discontinuous because in the construction that was used on those experimental pistons, the boss construction for carrying the wrist pin was such that you couldn't go all the way through. The boss was carried up by ribs to the top of the piston, and also extended up underneath what we term the land section of the piston which carries the ring, and that rib naturally would prevent

you from going up all the way through. The slot extending around the piston separated the skirt from the head section of the piston. The character of the connector passing from the boss to the piston head is quite hazy in my mind at this time. As I recollect it, there were two ribs running up from the boss to the top of the piston. Now, just what the sections of them were and the exact contour and shape, it has been so long ago that I couldn't remember that. Those two ribs were located one on each boss; that is the best recollection I have of the construction. The ribs extended vertically with respect to the wrist pin axis, and were in the plane of the wrist pin axis. They connected to the boss structure on the top section of the boss. The ribs connected with the inside wall of the ring land portion.

The slot between the head and the skirt portion of the piston was formed by the cutting of the milling slotting saw. I didn't see that operation, I couldn't remember that detail.

There was a slot running diagonally through the skirt of the piston in addition to the slot extending around the piston. This diagonal slot was slightly to one side of the wrist pin, looking at the piston in the plane view, the slot was off to one side. I can't recall the amount it was removed from the center of the thrust face of the piston; it was slightly off-center, though.

When I saw these finished pistons they were in the tool room of our plant. The only thing that causes me to recall it is the discussion we had; relative to this discussion, I was quite interested in knowing whether or not it was going to overcome the difficulties we had.

The patterns we had on hand for this experimental motor we had previously built with the aluminum pistons. That pattern was changed some; I believe the pattern was lagged up for diameter, and there were some slight changes made in the core box; it was in relation to the boss support of the wrist pin bosses, the ribbing. I don't recall the details of the changes.

The purpose of making up these pistons was to prove the theory of the split skirt piston, primarily. The theory was that the piston could be fitted closer and thus not get the seizure from action when the difference in the expansion of the two metals occurred, and at the same time reduce the noise of the motor. These specimens were tested by putting them into this Buda motor and by putting them on the road in this car and driven.

I refer to the experimental car that we used in connection with the Buda motor installation. The car was a company car at that time. Mr. Gulick had general charge of the driving of that car. Louis Slick was the foreman of the department at that time and naturally the work of supervising, manufacturing, fitting and mounting of these pistons in the car would come under his jurisdiction. Mr. Gulick was with the work all the time; that was his business. After the pistons were installed in the car, the car was used in test work and demonstration work, and it was later sold to Mr. Gulick.

The tests of the pistons in that car primarily was to determine whether or not this expansion and contraction of the piston was effective with this construction, and it was proven in this test that it was.

Mr. Bruninga: I object to that as a conclusion of the witness. He should state in his own words what he bases his conclusions on.

The Witness: I was going to do that. Prior to the installation of these pistons we of course were using the type of cast iron pistons furnished by the Buda Company. After putting the aluminum pistons in, we found that we had a slightly better acceleration and we didn't have the slaps and knocks as we call them, in the motor. It was this piston as we had had on our previous motor in which we had used aluminum pistons without the skirt with the slot.

(Narrative continued) I rode in the car in which these experimental pistons were placed, several times before the experimental pistons were placed in the car, and I rode in it afterwards. I was extremely interested in the pistons at that time. There were no other changes made in the car at that time. I rode in that experimental car several times after it was equipped with the particular pistons that I saw in the tool room of the Amplex Motor Company. There were six pistons put into that car, the car having six cylinders. The car was completely equipped with these pistons, since you can't change pistons in a car without having six of the same kind of pistons.

The wrist pin in the aluminum pistons that were installed in this experimental test car, of which I have testified, was floating in the wrist pin bosses, to my recollection. The pin was locked at the connecting rods. That was not a conventional construction at that time.

The conventional practice at that time was to lock the piston pins and the piston by means of a screw or pin into the wrist pin boss, which made the pin a component part of the piston. And this construction was changed so as to permit the piston pin to float in the piston and relieve the piston from strain.

The test pistons were installed in the experimental car prior to its sale to Mr. Gulick. That time I have no way of fixing because I don't have anything to bring to mind just exactly what the interval of time might have been. In fact I couldn't say just when that car was sold to Mr. Gulick, except it was in the summer of 1914, but the exact time of it I couldn't say. I remember making out a bill of sale to it, because at the time that Mr. Gulick bought the car, he bought it with the view of getting settlement on some money he had advanced to the company, and I was basing it on that. I made out a bill of sale on this deal, and I think I would recognize it. It was made out on one of our regular invoice forms.

(Witness examines Plaintiffs' Exhibit 28) This was the bill of sale covering the purchase of the model EK toy tonneau car No. 747, that I signed, and testify this is my signature. That is the car in which these aluminum pistons about which I have testified were tried out. I do not recognize the writing in red below my signature.

Mr. McCoy: I offer in evidence the bill of sale identified by the witness as Plaintiffs' Exhibit 28.

Mr. Bruninga: I object to that exhibit because first it has not been definitely connected up with that particular car, and, second, because matter has been inserted in red ink both on the face and in pencil on the back.

(Narrative continued) This bill of sale was made out July 16, 1914.

Mr. Sutherland: Let the record show the witness was looking at the paper when he answered the question.

(Narrative continued) I do not have an independent recollection as to the definite date that bill of sale was made out. The best recollection of it is the circumstance that brought about the sale, and that is the fact that the Ampler Manufacturing Company was not making the progress that it should in the financing of the company, and Mr. Gulick was trying to protect some of the money that he had put into it, by taking this car.

And that was all happening in about the middle of the summer of 1914. That is the nearest I can tie it up. The typewritten material was placed on this bill of sale on the date the paper bears. That typewritten material describes the car that was sold to Mr. Gulick at that time. There were no markings on the bill of sale below my name or on the reverse side at the time I signed it. The marking in blue pencil at the top of the bill of sale and also the exhibit markings were not on there at the time I delivered it. This bill of sale was delivered to Mr. Gulick in the middle of the summer, as near as I can recollect.

Q. I hand you a sheet of blank paper and a ruler and ask that you reproduce as near as you can the pistons which you saw machined up on the bench in the tool room of the Amplex Motor Company and that you have later testified were installed in the motor of the car described in the bill of sale, Plaintiffs' Exhibit 28, that you have identified.

(Short recess taken while witness makes sketch.)

Mr. McCoy: I have marked the sketch which the witness has made, as Plaintiffs' Exhibit 29.

Q. Will you please place letters of the alphabet on the parts of this piston that you have drawn and tell what they are?

(Narrative continued) Slot A, located above the wrist pin hole, is a slot running around the piston and not connecting at either end. B is a slot running diagonally lengthwise of the piston, connecting with slot A and opening through the lower end of the piston skirt. C is a single rib connecting the top of the wrist pin boss to the head of the piston. D is the skirt of the piston, which is straight, from a point marked E to F. G is a portion of the piston carrying rings, and is undercut for clearance in the cylinder. I think that is all. The slot running lengthwise of the piston, shown in the right hand view as B, is also shown as B in the left hand view.

The drawings made at the Amplex Motor Company plant, after Mr. Gulick worked at the plant, I believe carried a title at the lower right hand corner, with the draftsman's signature, either his name or initials, as to who made the drawings. I don't recall any specific name on the drawings. There might be a specification number there, or a name which would be descriptive, such as "cylinder" or "piston" or "connecting-rod," or other parts of the motor.

It was the usual practice to date drawings.

The series of blue-prints which you now show me, I identify as follows: The first print, marked A-2, is a complete assembly of the six-cylinder motor that we were working on at that time. I know that it was made at the Amplex Company because it bears Mr. Winchester's initials. This drawing A3 is the same motor, a view taken from the opposite side. The blue-print has been printed from the wrong side of the tracing, and Mr. Winchester's initials are backwards, as appears in the lower left hand corner. That is a detail of the sleeve that was to be used in the sleeve valve Gulick motor.

The initials on drawing marked A-38 are Rockhoff's initials.

The large blue-print marked "Crank case plan view, sheet 1" is a detail drawing of the crank case construction on the Gulick sleeve valve motor. The drawing and the tracing from which this blue-print was taken was made in the summer of 1914.

The blue-print marked "Gear cover" is a blue-print covering the detail construction of the gear cover used on the Gulick motor. The initials appearing in the lower right hand corner are Mr. Rockhoff's initials.

The blue-print marked A-47, is a detail of the water pump construction on the Gulick motor. The drawing was made by Mr. Rockhoff and bears his initials B.E.R. And Mr. Winchester's initials also appear in the lower right hand corner.

I recognise the drawing marked "Oil pan, sheet 1." It is a detail of the oil pan construction on the Gulick motor. The drawing was made by Frank U. Winchester. I know this because his initials appear on the lower right hand corner. I recognise those initials.

The blue-print marked A-60 is the crank shaft detail of the six-cylinder Gulick motor, made by Frank U. Winchester, whose initials appear in the lower right hand corner.

Mr. McCoy: The blue-prints which have been identified by the witness are marked for identification as Plaintiffs' Exhibit 30.

(Narrative continued). The blue-print marked for identification "Plaintiffs' Exhibit 31," is a cross-section drawing of the Gulick sleeve valve motor, made by Frank U. Winchester, which I recognise by his initials in the lower right hand corner of the print. The original drawing from which this blue-print was taken was

made in the summer of 1914. I saw them at work on this drawing, and I saw it after it was completed. Mr. Gulick was in the employ of the Amplex Motor Company at that time.

The blue-print marked "Plaintiffs' Exhibit 32" is a detail covering the piston designed for Gulick motor. The drawing was made by Mr. Rockhoff, which I identify by his initials in the lower right hand corner. I saw the original drawing from which this print was made. I saw tracings made, from which this blue-print was taken, at the Amplex Manufacturing Company at Mishawaka. Mr. Gulick was there at that time.

Referring to the blue-print, Plaintiffs' Exhibit 31, and the construction shown therein, the connecting rod was locked onto the wrist pin, permitting the wrist pin to float in the piston. That drawing shows the locking connection on the connecting rod.

The pistons shown in the drawing, Plaintiffs' Exhibit 32, were intended to be made of aluminum. The marking "Cast iron" on the face of this drawing would not change my opinion on that, because the common practice at that time was to make pistons of cast iron, and the draftsman would undoubtedly use the name "Cast iron" in that construction, without having been told differently.

Mr. Bruninga: I object to that as a conclusion of the witness.

The Master: Objection overruled.

(Narrative continued) The small bosses formed on the bottom of the wrist pin bearing in this Exhibit 32, was in accordance with the practice in cast iron construction; the pin was locked into the piston; it is also a detail. The left hand view of the drawing does not show this same construction. It shows an oil hole. The dotted lines indicated in back of the web structure that appears to extend at a slight angle with respect to the vertical axis of the piston, is intended for an oil return hole, I believe. That is a ¼" drill—yes, that is the same hole. That is a plain hole; it is not a tapped hole; it is a plain hole. That drawing plainly indicates that there is a hole in the top of the wrist pin boss of that piston as designed in the summer of 1914. That hole would be drilled in there, in accordance with our practice at the Amplex Company in 1914, from an angular direction so as to permit the drill to pass in from the open end of the piston. The drawing shows such construction. The drill is through this hole, continued on through this hole at the

top (indicating the bottom hole in the wrist pin boss and the top hole in the wrist pin boss). These same features of construction are also shown in the right hand view of the drawing. The right hand section shows the hole in the top of the boss connecting with another drilled hole leading to the outside wall of the piston.

This sketch, marked Plaintiffs' Exhibit 33, is very similar to the pistons that we made up for the Gulick car. The only difference that I can recollect is in this cross-section here; this is shown with a double rib construction to the boss, referring to Fig. 2. And my recollection of that section was that it was a single rib instead of a double rib. Other than that the piston is very much the same. This doesn't show the slot, that section in there; it would cut off with that slot, referring to Fig. 1. The diagonal slot does not show a continuation up to the slot running around the piston, due to the fact that half of this drawing is shown in section and half of it is shown in plan.

Mr. Braninga: That is objected to as a conclusion.

Q. Is this the same piston that you have testified to that was installed in the engine of the Gulick car shown in the bill of sale, Plaintiffs' Exhibit 28?

Mr. Braninga: Objected to as leading.

The Master: Objection overruled.

(Narrative continued) It is not the same piston. The design is approximately the same, with the exceptions that I have noted.

I believe I left the Simplex Motor Company in 1913. I left the employ of the Amplex Motor Car Company in April, 1915.

My association with Mr. Gulick was entirely at the Amplex Motor Car Company plant. That company went into receivership during Mr. Gulick's employ, in 1914. I can't retell the exact date on that; it is a matter of record. It was in the summer the proceedings were on.

I don't know where the original tracings, from which these blue-prints Plaintiffs' Exhibits 30, 31 and 32, were made, are at the present time.

I testified in proceedings in the Patent Office in 1926, I believe it was, but I am not familiar enough with the case to know what the numbers 49,579, 49,570, and 49,571

refer to. That interference related to the same subject-matter as this case.

I am not interested in any issue of this cause.

Mr. McCoy: The Witness is offered for cross examination.

Cross Examination by Mr. Bruninga.

I met Mr. Gulick in 1912; he was with the Excelsior Company at that time. It may have been 1911. It was two or three years prior to his coming over to Mishawaka. I was with the Amplex Company at that time. I just met Mr. Gulick in 1911. I don't know when he left the Excelsior Company. I was acquainted with him from the time I met him in Mishawaka. My meeting him in Mishawaka was merely a circumstance. He had no business connection there; he simply came over to the plant and I was introduced to him. In order that you may get this picture, he formerly was with the Simplex Motor Car Company as chief engineer, and I believe he had the title of Vice President, or something of that kind. When he came back to Mishawaka he came over to the plant. The Amplex Motor Car Company plant and the Simplex Motor Car Company plant are the same plant. He came over to the plant and I was introduced to him at that time.

The first time Mr. Gulick told me anything about the piston was in 1914. He didn't tell me about a compensating piston before that.

The diagonal slot, about which I testified in direct examination, connected to the slot running around the piston.

In the aluminum piston that we used before Mr. Gulick came over in 1914, we tried different schemes of oiling, by increasing the oil film around the piston, in an effort to rectify the trouble of slapping.

With reference to Exhibit 29, in which I show a single rib extending from the faces to the head, that was common practice at that time. The construction sometimes ran from the piston boss up to the side wall, and then they sometimes ran it up to the top of the head; that is a variation in practice. I didn't make a separate core box for that piston, but I understood that Mr. Gulick did make some changes in the core box. The original core box, my understanding, was used with some changes to accommodate the change in construction of this rib.

I don't know that for a fact; the original core box might have been used. The patterns were simply lagged up. I think that was done at the foundry. I don't know that; I was just testifying what somebody told me.

I didn't just hear that the pistons were machined by Mr. Johnson, I saw that. My recollection is that the slot ran from boss to boss, it didn't go all the way around. I said that the diagonal slot might have been on either side. There was only one diagonal slot; it might have been on either side of the boss. There were two semi-circumferential slots like A in Exhibit 29. When I said that that diagonal slot was slightly off-center, I meant that it was off-center from the boss, from the wrist pin boss. In other words, the slot did not extend down from this point; it was off to one side of that boss. It would be hard to determine at this time just how much off-center it was. The slot was nearer the boss than it was the center line of the piston. As I remember it, it was about half way between the boss and the center line of the piston. It started approximately as shown in Fig. 1 and Fig. 2, from the point marked "X" and extended diagonally towards the bottom of the piston. It didn't go around the piston. That angle was approximately ten degrees, about the same slant as B. This sketch here indicates how the slot ran, just as it is.

The slot surrounding the piston was directly below the lower ring dividing the skirt section of the piston from the head section, and that extended nearly all the way around. It extended nearly half way around on one side, and then nearly half way around on the other side, and then there was a slot that extended downwardly on an incline. This downwardly extending slot started at the edge of this groove and went down to the bottom. It would start from one side of the center hole on Exhibit 3-H, I would say about half way between that center and the boss. In other words, it started about half way in the center of the thrust face and the wrist pin boss, and then it went diagonally down to the bottom of the skirt. You understand this is just a free hand sketch; it is not supposed to be to scale; it is supposed to indicate this slot is slightly off-center. It just depends on which side of this view, Fig. 1 of Exhibit 29, you are looking at, where the slot starts. If you are looking at one side, it would be over to one side. If you turn the piston half way around, it would be on the opposite side. To the best of my knowledge it would be as I have it sketched here, with possibly the exaggeration of location.

I can read drawings well.

Fig. 1 shows the slot B starting almost near the center of one of the thrust faces; almost near the center, and point X would be about half way between the center and the wrist pin bosses; the inside of the wrist pin bosses. In other words, there would be a starting point on Exhibit 3-H practically 5/8" from the edge of the relief, and then it extended downwardly diagonally. The pattern for that piston, as originally made, had one rib. I don't remember how many ribs the piston had that was actually tried out in that car. I may be wrong, but my impression was that the slots A went part way around; and the reason I think that is the fact that the constructions of the piston as originally made wouldn't have provided for a slot to go clear through at that point.

All the pistons in the Amplex car sold to Mr. Gulick were made alike. I am quite sure the pistons in that car did not have a relief in the region of the wrist pin bosses, for instance, like shown in Exhibit 3-H. They were turned all the way around. They had a relief on the top section, or the ring groove section. That section was made smaller, which was common practice at that time. That piston was machined in our tool room by Mr. Johnson and proceeded with the operation from one to the other, and wouldn't come under my observation. The particular pistons like shown in Exhibits 1 and 2 (Figs. 1 and 2) which were later tried out in the Amplex car, had a straight skirt. I can't remember what clearance was allowed, at this time. It was in the matter of thousandths, a very small amount of clearance. The reason that that stands out in my mind quite fresh is because of the discussion that Gulick and I had at that time relative to the use of an aluminum piston, and we had argued the point back and forth as to whether aluminum pistons could be used in that construction, automobile. The clearance allowed for these pistons was less than we allowed in aluminum pistons without the split; I would say that the skirt was approximately three-thousandths less in diameter than the cylinder in which it was put, for the reason that in our first construction we didn't use a slotted piston; we used the solid type piston, and our clearance at that time ran about seven or eight thousandths. We found that with this practice we could decrease that amount of clearance, in fact that was the aim of the construction, to permit of a tighter fitting piston and not produce a piston slap. That piston had a floating wrist pin in it; by that I mean the wrist pin was

free of the wrist pin bosses; that is, the wrist pin goes through.

I rode in that Amplex car when these particular pistons were tried out. There was no trouble experienced in the piston at any time while it was under my observation. I took a number of trips in that car. I would say that car was run approximately 65 to 68 miles an hour on pavement and on gravel roads around Mishawaka, extending over to Elkhart; most of our testing was done between Mishawaka and Elkhart; at that time it was about a half paved road and half gravel road. That was a water-cooled car. There was no trouble experienced with seizing, even though there were no reliefs in the region of the wrist pin bosses on the outside, and with aluminum pistons.

In order that you may get the picture of that car, this car was used as an experimental car. Mr. Gulick, who was recognized as our chief engineer, had the use of that car practically to himself. This experimental work was carried on during that time. Later on the company became a little questionable as to whether they could carry on. Mr. Gulick had advanced some money to the company, and he came to me and made arrangements to transfer this car to him for a consideration, in order to take care of the money that he had advanced, and the actual transfer of the car to him, technically, you might say, was when this bill of sale was made over to him in July; but he had had this car in his use; it was a factory car up to the time we turned it over to Mr. Gulick. I couldn't swear as to whether those particular pistons were in that car when the bill of sale was made out to Mr. Gulick, because they might have had an opportunity to take those pistons out without me knowing it.

I did not place the particular notation in red ink on the bottom of Exhibit 28, nor do I know who did. I don't know whose handwriting that is.

It was the usual practice at the Amplex Company at that time to carry a date line and what you call a title line at the right hand corner of the print, especially on details. I would say that the drawings that I saw in 1914 had that particular notation on them, because our drawings carried that notation. Today is the first time I have seen the blue-prints that were produced here, since 1926, I think it was. It was at the time I testified for Mr. Gulick in the interference in which he was involved in the Patent Office.

Referring to drawing A-38, which is one of the drawings marked Plaintiffs' Exhibit 30, I would interpret that the sleeve is split. I also find that split in the drawing marked A1, Exhibit 31. I don't know why that sleeve was split; I don't know that it was to take care of expansion and contraction, but it would have some influence on it. Primarily it might have had a purpose. I wouldn't want to testify to that point, because I didn't design that particular construction. That is Mr. Gulick's design, and he didn't explain that to me. That is not the first sleeve valve motor I saw; I saw a Knight before that, and I built a sleeve valve motor myself before that. The sleeves were integral and not split at all. The Knight sleeve was integral and not split.

Q. I understand those drawings have not been offered in evidence as yet, just marked for identification.

Mr. McCoy: Then plaintiffs offer in evidence the set of blueprints marked for identification Plaintiffs' Exhibit 30; the blueprint showing a cross-section of the Gulick engine, marked for identification Plaintiffs' Exhibit 31; the blueprint showing the details of the piston construction, marked for identification Plaintiffs' Exhibit 32; the bill of sale marked for identification Plaintiffs' Exhibit 28; and the sketch made by the witness marked for identification Plaintiffs' Exhibit 29. These sketches, these exhibits, are offered in evidence under the same exhibit numbers as applied thereto for identification purposes, subject to substitution of photostatic copies for all of the exhibits offered.

Mr. Brusinga: I have no objection to the substitution of photostatic copies, provided the exhibits are properly offerable in evidence. As to Exhibit 28, I object to that because the exhibit has obviously been changed since this witness has signed it, and that should be explained in some way or other by some other witness.

As to Exhibit 29 I want to make an objection to that because I don't think it is a correct representation. I believe that goes more to the weight, however, than anything else; I just want to preserve my objection. As to Exhibit 31, that is not an original; that is a blueprint, a copy, and it has not been shown that the original has been lost, I want to make the same objection as to 32.

The Master: They will be received at this time, with that reservation.

Mr. McCoy: This sketch marked for identification Plaintiffs' Exhibit 33, will not be offered at this time. (Sketch later offered in evidence as Plaintiffs' Exhibit 62, R. p. 770.)

(Narrative continued) That drawing, Exhibit 32, carries the title for cast iron, but it is my opinion that that is designed for an aluminum piston. It is the practice to make aluminum pistons with a skirt 1/16", and even thinner, of that diameter. It was not usual to make cast iron pistons with skirts 1/16" thick; it was usual to make them heavier.

In looking at this drawing, Exhibit 32, a second time, I believe that the small bosses were put on the bottom of the wrist pin bosses merely for locating points in drilling through to make the oil hole or reach the oil hole on the upper part of the boss. It would be necessary in such a case, in order to start the drill. The boss is round; in order to start the drill you would have to have a flat spot.

I said that Exhibit 33 represented my recollection as to the construction of those pistons that were put in the car that Mr. Gulick later bought, and that there was only one rib instead of two ribs; and it is my recollection that the slot was designed approximately that way. It was my intention that the construction shown in Exhibit 29 was to be about the same as shown in Exhibit 33, although I didn't have this drawing before me when I made this other one. On Exhibit 33 the groove is shown entirely around the piston, and on Exhibit 29 it is not. It is my recollection that the slot went only part way around, it being interrupted in the region of the wrist pin bosses. I don't know whether it had two ribs or one rib. I am assuming and think it had one rib, because the pattern originally was made with one rib; I don't know of any change. If it had two ribs it would be possible for them to go all the way around. I remember very distinctly of seeing all of these drawings before seeing them here today. I saw these particular drawings in 1926. I don't testify to seeing any drawings of pistons; there could be any number of blueprints made from the original ones. I mean the same design and construction.

I don't know whether any pistons like Exhibit 32 were ever made at the Amplex. I was there and away from there until 1915. At that time, in the summer of 1914, I was working also for another company down here near Cleveland on consulting work and reorganization of the company, and I went back and forth between the

two plants; so that my entire time wasn't devoted to that job.

I wasn't asked here to describe this particular piston as shown in Exhibit 32 before I was shown this blueprint; I did describe it in the case of Exhibit 29, I described that first and then I made a sketch of it.

It is too far back for me to remember the diameter of the cylinder bore of the Gulick motor of these drawings; I could guess, but I don't believe it is advisable to guess on such a thing. The diameter of the cylinder in that Amplex car was approximately 3¼". In 1914 it was customary to allow .001" to the inch in diameter for cast iron pistons, and we allowed about double that for aluminum pistons. I am testifying entirely from memory. It is rather difficult to remember details, when you go back to 1914.

I did not see any of those Gulick pistons like in Exhibit 29 after they had been run. I didn't see those pistons put in the car, but I knew they were put in there, because I knew they were working on the job at the plant. I did not actually see them put in. I knew the motor had been torn down. I saw that done. It was torn down to put the pistons in. My position at that time was manager of the plant, and I was in the office. The work was done out in our assembling department. I do know that those pistons were put in that automobile, because I was told they were in there. I can answer that maybe to meet your point in this way: the pistons were put in the motor for a test, and I was out in the car in that test and observed the action of the pistons to see what happened, and those pistons were in that car at that time. I couldn't swear that those pistons were in that car, because I didn't put them in myself. I didn't see them put in. I didn't see the pistons after they were taken out of the car. I don't know what their condition was after they might have been run for a hundred miles.

Mr. Bruninga: That is all.

Re-Direct Examination by Mr. McCoy.

I saw the pattern from which the pistons that I have sketched in Exhibit 29 were made. That pattern was lagged up to get the right diameter for machining. I think that lagging was done at the foundry. I did not see the lagging after it was done.

The blueprint marked A-38 shows a valve sleeve in the lower right hand corner.

Looking at Plaintiffs' Exhibit 31, one side of the sleeve is the intake valve and the other side of the sleeve is the exhaust valve. These sleeves would move separately. The double dotted line, extending longitudinally through the center of the cylinder sleeve is the slotted section of the sleeve. The sleeve is finished in one unit and then slotted. The units are not connected in any way after assembly. That is indicated by the dotted lines.

Mr. McCoy: That is all.
Mr. Bruninga: That is all.

Thereupon, the Plaintiffs called as a witness in rebuttal, FRED A. MULRINE, who, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Fred A. Mulrine. I am foreman of the motor assembly at Studebaker, South Bend, Indiana. I live at 222 East 18th Street, South Bend.

I am acquainted with Mr. Edward J. Gulick and have known him since 1906. I worked in the same company with him from 1906 until 1914. I wasn't employed —this company had gone into the hands of a receiver once or twice during that time, but I was employed with him all the time from 1906 to 1914 with the exception of about three months that I was in Findlay, Ohio, in the latter part of 1913 and 1914. Pardon me, it was 1914 and 1915 I was in Findlay, Ohio; the latter part of 1914 and the early part of 1915 I was in Findlay.

I think the name of the company, at the time I was working with Mr. Gulick, was Amplex Manufacturing Company. It was the Amplex Motor Company previous to that. After it went into the hands of a receiver it took the name of Amplex Manufacturing Company. My work with that company was service work, in the field mostly. I was acting as an automobile mechanic, taking care of trouble on the road or in the field. I traveled between Mishawaka and New York City, mostly.

I had motor experience prior to 1914, the nature of which was motor building, mostly. That was from 1906.

During the latter period of his employment with the Amplex Motor Company, Mr. Gulick was busy developing another motor, I know that. It was a new piston, an aluminum piston, flexible or split skirt piston. However, I never saw that piston.

All I know about that piston is from hearsay in talking with Mr. Gulick, and that was sometime ago, of course. As I remember, he was developing a piston that wouldn't seize, with a flexible or split skirt. That is all I can recall regarding the structure, aside from the fact that after Mr. Gulick had built up this engine he called on me one Sunday morning—Sunday afternoon—to take a ride in the car with him, wanted to show me how it run, and he took Mrs. Mulrine and myself, and we went with him to Elkhart, Indiana, a distance of about 12 or 14 miles, and attended the races that afternoon, automobile races, that Sunday afternoon, and back, of course he talked particularly about the smoothness of this engine, running of this engine.

Mr. Bruninga: I object to that as hearsay.

The Master: The witness has answered. I will let it stand.

(Narrative continued) I really couldn't recall what Mr. Gulick told me regarding the structure of the piston that was in that motor at the time I testified the ride was taken with him to Elkhart, aside from the fact that it was a piston that was going to eliminate chances of scoring.

Mr. McCoy: Direct examination closed.

Mr. Bruninga: No cross examination.

Thereupon, the Plaintiffs called as a witness, in rebuttal, BERT E. ROCKHOFF, who, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Bert E. Rockhoff. I live at 73 Beaupre Avenue, Grosse Pointe Farms, Michigan. I am at present with the Detroit Steel Products Company, in charge of designing, engineering, development work. We make steel window sash, automobile springs, and railway springs.

I am acquainted with Edward J. Gulick. I met Mr. Gulick prior to 1914; I saw him around 1912 first, would be my best recollection. I worked in the same company with him, at the Amplex Company, I believe it was the Amplex Motor Company, we called it. It was located on Burkett Avenue, I remember, right near the Lake Shore & Michigan Southern Railway, in Mishawaka, Indiana. I believe it was in 1913 that I was working at that company. I know in 1914 I was employed in Detroit, so it

must have been prior to that, I believe it was 1913. I was a detail draftsman at the Amplex Company, under the supervision of Mr. Frank Winchester and Mr. Gulick. That is, Frank Winchester was next above me and he was in charge of all designing. I was employed continuously during the time I was with the Amplex Company. I couldn't recall how long a period it was, but it covered a period of some months; I couldn't say exactly now.

We were designing automobile motors at that time; the one in particular that I recall was a sleeve valve motor, there were other designs that we had worked on, but I particularly worked on this sleeve valve motor. I remember that the motor had a new type piston. I remember that it had the double split sleeves, I would call them. These sleeves were operated by eccentrics. I remember those characteristics. And then it had this piston that we are speaking of, and a special type of aluminum head on it. Those features of it I could recall.

As I recall the piston now, it had a head which carried the rings, that is an upper portion, you might call it, which carried the piston rings. That was separate and detached from the lower portion. It was cylindrical in shape, and the only connection between the two was an indirect connection inside the piston from the head to the skirt, but this skirt was entirely separated from the head by a groove that was machined clean through the piston, and then the skirt of it in turn was flexible, was made flexible by a slot. That slot was just a saw slot, I suppose, put in with a slitting saw in the milling machine; it ran diagonally across the skirt. It went all the way through the skirt, that is from the top of the skirt across to the bottom. I am not exactly sure where the slot was placed with reference to the bosses of the piston. I recall the slot, it seems to me it was located in such a way that it came on the side at right angles to the pin, but I wouldn't be too sure about it. That is the way I recall the piston at the time.

The connection between the head and the bosses in that piston was what we call a rib, you might say. I can remember the shape of it because I drew it myself. And there were two of these ribs, rather I should say, and these two ribs also had the piston pin bosses cast right on them, so that these ribs performed a double function; that is, they performed the function of connecting the head with the skirt and providing an anchorage or place for the piston pin bearing.

I couldn't just recall the exact conversation between Mr. Gulick and myself at that time. Of course I was thoroughly familiar with the reasons for these things at the time. Just whether he explained it or not, I don't remember the exact conversation, but we did have conferences around my board on that piston, the three of us conferred together. Of course I received my instructions as to how to detail it, and there were conversations aside as to the relative merits of these particular designs, and so on. I didn't take part so much in that myself; Mr. Winchester and Mr. Gulick discussed those more freely. I was just a detail man but I overheard them all; I overheard a lot. We talked about the merit of splitting the skirt, and the merit of separating the head from the skirt, and things of that nature, they were talked about. When I first laid the piston out, it was designed for cast iron, on the detail drawing that I made. But it was discussed making it in aluminum. But the drawing I made I feel quite certain that this material I specified on that was cast iron.

I saw other drawings beside the piston drawing. There were many other details of the motor that I saw at other times, and other details I made, too. The company drawings had the title in the lower right-hand corner, as all drawings have; it wasn't characteristic of those drawings; we filled it in ourselves. In the lower right-hand corner of the drawings we always initialled the drawing, and put the date of the drawing, when we finished the drawing we would put our initial on, I would put the name of the drawing and name of the company.

I believe there was a title for this particular type of motor I testified about, although I can't say from memory what we put on there for title now, that has been too long ago.

I can't recall definitely whether or not these pistons were ever made up into metal. I know that various parts of the motor were actually made. I saw patterns for them, some of them, by which I can definitely recall it. I cannot say I definitely recall the piston pattern, but I know it was intended to go through, make all the patterns for the motor; some of them I can recall—the cylinder block and head, I recall of course because they were large pieces. That motor was not in use by the company at the time I was working on these drawings, that I know of. I don't remember of it being completed.

Q. Were any pistons tested out by the Amplex Motor Company or by the personnel there to your knowl-

edge? A. I know pistons were tested out. I was not in the test department myself, I only know that by hearing it.

Mr. Bruninga: I object to the answer and ask it be stricken out.

(Narrative continued) I believe I could recognize my lettering and initialing, etc. on the drawings on which I was working at the Amplex Company.

That piston was intended to operate like a cast iron piston would operate, that is, within a cylinder, in this particular case the inner bore of that cylinder was an inner sleeve, between which the semi-circular sleeve I spoke of before slid between this inner sleeve and this cylinder wall casting, and this piston was intended to reciprocate in this inner sleeve. Now, if the operation includes the merits of that particular design, I know what they were contended to be at the time. The piston structure was intended to function in this way, that the head being attached to the skirt, the transference of heat would not be so great from the skirt to the head, and the skirt being flexible would make it possible to fit it with less clearance to the cylinder, in that way it could be made a better fit.

The piston could be fitted with less clearance to the cylinder because the skirt was split and there was flexibility. The skirt being cylindrical permitted it to flex; it would go like a piston ring. The inside structure of the skirt permitted that operation. These two ribs that went down were separate, there was no connection crossways between them. The wrist pin was carried on bosses that were carried on these ribs in this piston. The bosses were cast on the ribs. I wouldn't say offhand whether the piston pin was anchored in the boss or whether it floated. The drawing will show it. I couldn't tell you from memory.

Mr. Bruninga: I want the record to show that up to this point there has been a regular display of split pistons before this witness (indicating exhibits which are on table beside witness).

(Narrative continued) (Witness examines blueprints marked for identification as Plaintiffs' Exhibit 60). This (indicating sheet 1) is a blueprint of a crankcase. I remember that one distinctly because we had a lot of discussion about that. The drawing marked A-60 I can remember very well, all the lightening holes in the

main bearings and this wrist pin, lots of discussion about that, the oil throwing flange; this is Mr. Gulick's method of dowling on the flywheel.

Referring to the lower right-hand figure of the drawing, I recognize that marking; I remember the "E. J. G. motor," the Gulick motor, which all of them had, and Winchester's initialling.

I couldn't give you from memory the dates of the original drawing from which this print was made. All I know is I left there some time in 1914 and worked there prior to that time. As to dates, I couldn't tell unless I looked up some records. This drawing was made during the time I was with the company.

The second drawing included in the group, marked "Plaintiffs' Exhibit 30, Crankcase plan view, sheet No. 1," is a drawing of the crankcase. The crankshaft was to run in these bearings. I can't say that I remember this tracing being made, but I remember the drawing being made. This blueprint was made of a tracing which was made from the detailed drawing on the drawing paper that I had, but I didn't make this one myself. I saw this drawing being worked on while I was employed at the Amplex Motor Company, but whether it was the tracing or the original drawing I can't recall.

I don't recall the third drawing in the same group, marked "Plaintiffs' Exhibit 30, Gear Cover," so distinctly. I can recognize that belongs on there all right. Here are the two drive shafts, driving those eccentrics that came in there, and so on. I say I didn't work on all these drawings, some of these drawings Mr. Winchester made them and I didn't have so much to do with them. I can't remember that. I evidently detailed it, my initials are on there, but I can't recall offhand. There is my initial right there. That is my lettering. For some reason or other, I can't remember actually making the drawing.

I remember that oil pan shown in the drawing of the same group of blueprints marked "Plaintiffs' Exhibit 30," and in the lower right-hand corner "Oil pan, sheet 1." I remember the discussion about it and the double bottom, all right.

Referring to the drawing bearing the notation "Valve gear," that is the valve I spoke to you about, which did like this one does, in two pieces; here is the two halves; there is the oil groove intended to keep the oil moving on the surfaces; these are the ports through which the gases pass; I can remember that. And then

these two holes here with a little lug fastened on to which the connecting rods were attached; they in turn were operated by this eccentric. I can remember them quite distinctly. I can remember making that drawing. There in the lower right hand corner is my initials, the date I put on there, which I always put on when I finished, and the "E. J. G. motor," and so on. All this lettering is mine; I did that all myself. I used to letter with the flat of a pencil; you recognize that, slightly flat of a pencil.

I have seen drawing marked A-2 of the same group, often. That was a profile picture of this E. J. G. motor.

I remember the drawing marked A-3. Those laid around there quite a bit.

The drawing marked "Plaintiffs' Exhibit 31" was a cross-section of this E. J. G. sleeve valve motor, and this inner sleeve is the stationary sleeve, this is the outer wall of the cylinder casting, and these were the two semi-circular sleeves that slid between this sleeve and the cylinder casting. This is that lug that I spoke to you about that attached onto this semi-circular sleeve. Here are the eccentrics that operate the sleeve. I remember that distinctly, that drawing was almost all the time there for reference and used largely in detailing parts of the motor, for instance your sleeve, getting your dimensions, you would use this drawing. There are the ports I spoke of, the exhaust and intake ports. And this is the piston that I spoke of. That is the upper part that carried the rings; there is the lower cylindrical part I spoke of. Here are those ribs that attach to the skirt, and here attached to the head, there were two of them, one on each side of the connecting rod. This is the rib. Applying numerals to the different parts, we can call that head 1, for example; we will call this skirt 2; we will call this rib here 3. In this head 1 is the head I referred to that had the rings on; in this case it was a sort of composite ring, and that was the head I referred to as being detached from the skirt, which is here marked 2, the detachment being accomplished by milling or machining a groove or slot all the way through at this point. You might call that point A. The only connection between the head and the skirt being these two ribs which were inside of the piston proper. The wrist pin was carried in that piston by two bosses, one on each of these ribs marked 3. As I said, it is evident now from this drawing, it was anchored in the connecting rod and therefore must have turned in the piston

pin bosses. I recall this drawing distinctly. Here is your boss on the connecting rod. There was a boss cast on each one of those ribs marked 3 here. Those bosses of course were machined out, probably reamed, and they served as bearings for this piston pin, or wrist pin, I think you would possibly call it.

The fact that the piston was fastened onto the connecting rod here by this clamp screw prevented it sliding in the direction of its length. The clamp screw (marked 4 by the witness), going through the bosses on the connecting rod, tightening the entire rod on the pin so that the pin was held stationary, laterally on the connecting rod, therefore it couldn't slide off laterally through the piston bosses.

I recognize the blueprint, marked B-3, quite distinctly. That is the same piston. You will notice this is detailed right from that drawing. Here is your head again, with your groove to carry the rings. I would call this head portion 1, skirt portion 2, rib I would call 3, I would call this boss 4. If there is reference to any other things we could number them as we go; but this portion here is the head, I refer to head 1, separated from the skirt 2 by this groove. You will notice the finished marks or groove that was finished out, and the only connection between the skirt and the head being these two ribs marked 3; and you will notice there are two ribs, you might call them 3-A and 3-B.

Referring to the right-hand view, you will notice the bosses that were cast right on these ribs. This is a cross section. You will notice this section is sectioned there, the bosses are these integral portions of the rib, being cast right on there. (Witness marks the numeral 4 where the bosses are.) The other ribbing in the head was to give it a little lateral strength. There is a little rib in here, which I will mark 5, in this view, also. And then on the inside there was a similar reinforcing rim, we will call 6. Those were purely reinforcing ribs.

The reinforcing ribs were at right angles to the ribs that connected the head and the skirt. In other words, the reinforcing ribs 5 and 6 were at right angles to the ribs 3, and connected the rib and the piston pin boss in such a way it formed a reinforcement. There was a means in that piston for lubricating the wrist pin. The oil was supposed to be collected in this little groove here and carried down through this little tube that connected up with this boss. We will call this groove No. 7. This is marked there, identified "oil pipe ⅛" outside diam-

eter." We might call that oil pipe 8. That was inserted. You see there was a little boss provided and drilled, inserted in there so the oil would flow through. The oil would collect around this little groove, marked 7, at the top of the skirt. The opening through which the oil was delivered to the boss was just drilled in there, as I remember it, a hole run up through here, and that little pipe connected up to that hole. I don't recall any lock pin to hold that piston pin in there.

The openings 10 in the bottom of the boss look as though they might have been for pins, I couldn't tell you now, my recollection is not clear. That opening is shown right there; that is the same opening. They look as though they were made for a pin. The oil hole 11 was drilled through from the little boss 12 on the wrist pin boss. That is the way the drawing called for. Here is your quarter-inch drill called for, and continued on through, the same center line goes on. Here is your ninety degrees. The purpose of this boss 12 I can't recall now; I can't tell you why that boss was there. I recall being instructed to put this oil pipe 10 in to carry oil down there, but beyond that I don't remember now whether it was intended for that lubrication, to carry farther than that I don't know. It looks evidently that it was intended to carry through there. You could not form the oil hole at the top of the boss without forming the hole in the bottom of the boss unless you went through the head of the piston, which would not be very good policy. In order to drill oil hole 11 you would have to drill hole 10. That accounts for the boss 11, in my opinion. We often do that, put a boss for the purpose of starting a drill, so you have a surface to start the drill.

In this particular case the boss is not clearly finished on that drawing. I imagine it was intended that the drill be started at right angles to the boss, ninety degrees. I would say if anything that was an oversight on my part in not bringing this line around here, the purpose of it being to have a point for your drill to start on. That is not peculiar of this job; it is well known to do that.

I couldn't tell you when the drawings, marked A-1 and B-2, and identified in evidence as Plaintiffs' Exhibits 31 and 32, were made without seeing the date on the drawings, except that I know they were made prior to the time I left for Detroit, which was some time in 1914, but I couldn't tell you from memory. The draw-

ings were made in that Amplex Motor Co.'s office on Burkett across or near the railroad.

I made Plaintiffs' Exhibit 32 drawing myself; it has my initials. I actually recall working on the drawing on the board. We had quite a few conferences standing around the board on that job. Messrs. Winchester, Gulick and myself were in those conferences. In those conferences we discussed quite a number of things; the design of the piston, the thickness of the various parts, and the proper proportion of the ribs to get a good casting, how much to allow on there, and so on, and the width of the groove, things like that, all those things were determined by discussion.

Winchester acted in the capacity sort of chief draftsman, and Gulick was the designer, and his word was always the last word, of course. And in the absence of Mr. Gulick of course I took instructions from Mr. Winchester.

Exhibit 31 is one of Mr. Winchester's.

The piston shown in Plaintiffs' Exhibit 32 and the structure shown in Plaintiffs' Exhibit 31 are the same pistons exactly. This piston (indicating 32) is detailed from this layout (indicating 31). That is, the piston in 32 is a detail of the layout in 31.

I can't recall the actual making of the pistons at the Amplex Company plant during my term of employment, because as I say, I worked in the drafting room and the work was done out in the shop. I remember the drawings more particularly.

The meaning of the term "E. J. G. motor" was that E. J. G. were Mr. Gulick's initials.

I always put my date on the drawing when the drawing was completed. Of course afterwards there might be a correction or so on the drawing, but when we made our detailed drawing and finished it ready for inspection of Mr. Winchester or Mr. Gulick, we put our date on and initialed it. I put the date on Plaintiffs' Exhibit 32 myself, when the drawing was finished, "6-24-14," that is the date. I don't know where the original drawings are now, or where the original tracings are.

I am the Bert E. Rockhoff who testified in Interferences 49,569, 49,570, and 49,571 that involved this same piston structure; I don't remember the date, but I remember when the testimony was given.

My father's name is William H. Rockhoff. At the time I was employed at the Amplex Company's plant, he was the owner, part owner, of the American Castings

Company; they made aluminum castings. That company was located on the Lake Shore & Michigan Southern Railroad and Burkett Avenue. That company principally made aluminum castings.

Q. Do you know of your own knowledge whether they made aluminum castings for the Amplex Motor Company?

Mr. Bruninga: I object to it as leading.

The Master: I think he may answer that.

A. Yes.

(Narrative continued) I know the Amplex Company made pistons that went over into the plant of the American Castings Company. I can't recall any signed order, but we made pistons that were delivered over there.

Mr. McCoy: Direct examination closed.

Cross Examination by Mr. Bruninga.

Referring to the drawings, Exhibits 31 and 32 that I just examined, it is possible that there were bushings in them. If the wrist pin bosses were to receive a set screw, they would have been tapped; they weren't tapped. They aren't completed at the bottom; that is an oversight there. They should not be full across there. I don't believe that it was an oversight that I didn't put a thread in there, because it calls for a drill; it doesn't call for any tap there; it would have been a double oversight, then. I know that jigs are employed to drill holes in castings of that kind. With a jig, a hole could be drilled; but it is always more convenient to have your drill start on a flat surface. The drill has a tendency to pull over if you don't. As a draftsman I usually did put a boss on a rounded surface that a hole was to be drilled into. Those are usually the instructions of the designer, to do anything like that.

Q. But it would be perfectly possible to put the bushing in those wrist pin bosses and plant them by a set screw and then drill a hole through the bushing in line with the hole 11, to bush those bearings; isn't that right?

Mr. McCoy: I object. I think opposing counsel ought to ask the witness for the particular structure before him before asking him what might or might not happen.

The Master: He is calling his attention to the drawing; I think the question is competent; he may answer.

A. That is possible there; you can clamp a bushing in any boss if you want to; but this hole is drilled clean through. It would be rather absurd to tap the bottom hole. You wouldn't do any more work than you had to. If you did have a tapped hole at the bottom you would drill through there, not merely for the tapped hole; you would only drill through as far as the hole you had to drill. If you did put a hole through at the top, you would drill through the same bottom hole; then of course this hole would be a tapped hole, and that one would only be drilled.

It was quite common in 1914 to bush cast iron pistons. I expect I placed the notation "cast iron" on the bottom of that drawing; that was the material called for on this drawing for that piston.

We thought the thickness of 1/16" of the skirt wall was just about right for cast iron pistons of that size.

I made that drawing.

In my answer to Mr. McCoy's question with reference to Exhibit 31, the main cross-sectional view, wherein I said "like this piston that I spoke to you about," I meant when I was talking about this piston here on the chair.

I don't know when I last saw that drawing. I saw it at the Packard Motor Company once. I saw it when I testified in the previous case. I don't believe I met the attorneys in that case until I came up there to testify; I can't recall talking to them. I have talked with nobody about these pistons in the last couple of months except to my brother, Alisle W. Rockhoff, telling him we were called down here. We both knew we were called down to discuss the piston. Of course he is not so familiar with it as I am. I told my brother that I was coming down here on this case and I supposed this was one thing—not to discuss the construction end of the piston; I didn't discuss the piston with him at that time.

The American Castings Company made aluminum castings principally; we made some brass castings, but that wasn't our business.

I met Mr. Gulick about 1912. I couldn't recall definitely the date I met him, but we came to South Bend, as I recall it, in the latter part of 1911, and it wasn't very long after I became acquainted with Mr. Gulick through my association with the American Castings Company.

In the early part of my testimony, where I said "The piston that we have been speaking about," I don't recall that, but my brother and I talked about these pistons, said we were coming down here on this particular case, and, of course, we mentioned these pistons. I wouldn't say we talked about this piston construction. My brother doesn't know what this is, the construction of it, from the design standpoint.

The piston I had in mind in my direct examination, that had an aluminum head, was the piston on that drawing there that had the aluminum head separated from the skirt; the skirt would be immaterial; it is all one casting.

In my direct examination I said "as I recall the piston now," but I never had any different recollection. Of course those things are so long ago you have to scratch your head a little bit to remember some of those things. In other words, when I saw these drawings of the piston Exhibits 31 and 32, they refreshed my memory, although I think I could have sketched the piston in general even before I saw the drawing. I could have sketched that any time. I was not asked whether or not I could sketch that piston on direct examination.

I didn't see Mr. McCoy until I came into this room here. I saw no one except Mr. Edgerton, my brother and father; I just saw my father today, when I came to town.

Mr. McCoy: Let the record show that Mr. Edgerton is employed by the firm of Richey & Watts, of whom F. O. Richey is a partner.

(Narrative continued) I did not discuss this piston with anybody in Richey & Watts' office before I came here, nor did I discuss it with Mr. Edgerton.

The people I mentioned includes all of the people I have talked to with reference to this piston in the last three or four months. Of course this piston has been the subject of conversation among engineers for years. I might have talked to other people about this piston; that is evident; but I can't recall any discussion relative to this case. I mean by that the subject of discussion among engineers themselves. All gas engine engineers talk about a piston like this at different times.

My expenses, railroad fare, and so on are being paid on this trip, and nothing else. I got permission to come down here; I simply laid off from work.

I didn't make that big drawing of the cross-sectional motor, but I made the little drawing, Exhibit 32. I wasn't a lay-out man; I was only a detail man. I made the detail drawing.

Mr. Bruninga: Cross examination closed.

Re-Direct Examination by Mr. McCoy.

I couldn't clearly recall whether or not the piston shown in Plaintiffs' Exhibit 32, was intended to have bushings in the bosses; but I would take it that it was, probably; pistons of that nature often had brass bushings in them.

The wrist pin 5 would be indicated in that cross-section of Plaintiffs' Exhibits 31 and 32, the part of the cross-section that is typical. This cross-section shows the pin through the connecting rod, and of course the bushing itself is not clearly shown; the pin is shown; whether the bushing is there or not, I couldn't tell from this drawing. There would be one possible method of determining that. Knowing the size of this hole, and the size of that piston pin, you would know whether there was something required to fill up the additional difference in diameter. In these drawings, Exhibits 31 and 32, the wrist pin, from the fact that it was clamped on to the rod, was apparently intended to move in these bosses to oscillate in those bosses. That is additionally brought out by the fact that your lubrication is carried to this point. There would be no need for set screws in the bosses on that piston, if it would oscillate. The set screws are always put in straight. There wouldn't have been any reason for that angle at all. It would have been much easier to put it on straight, on the center line, if you wanted just a set screw. There would be no bushings used in the wrist pin bosses if it were intended to clamp the wrist pin in those bosses by means of a set screw.

Mr. McCoy: That is all.

Thereupon the Plaintiffs called as a witness, in rebuttal, William H. Rockhoff, who, being first duly sworn, testified as follows:

Direct Examination by Mr. McCoy.

My name is William H. Rockhoff; age 69. I live in Cleveland, 6204 Clinton Avenue. At the present time my occupation is metal pattern maker with the Westinghouse Electric & Manufacturing Company, at the foot of West 58th and Bulkley Boulevard. My sons' names are Bert E. Rockhoff, the oldest one; Roland F. Rockhoff of Pasadena; and Alisle W. Rockhoff.

I know Edward J. Gulick. I met him somewhere around 1913 or 1914 at Mishawaka, Indiana. At that time I was running an aluminum foundry, called American Castings Company, and located on Burkett Avenue, alongside of the New York Central Railroad, right opposite the Amplex Motor Car Company. Two of my sons worked with me in that foundry; Roland was in there some time, and Alisle.

When I knew Mr. Gulick he was across the street at the Amplex Motor Car Company. I knew him because he had some castings made at our place; and he came over there to see us several times in regard to the castings, which were aluminum piston castings. That was during the summer of 1914, I don't know just what date or month.

Those castings were for just an ordinary piston, as far as I could see. I don't know that there was anything special about them that I can see on them; just straight wall. Mr. Gulick brought the pattern and core box over to the foundry personally for those castings.

I don't remember whether or not there was a receivership in connection with the Amplex Motor Company around that time; there were several receiverships there; I don't remember just when they were; but I do know there were receiverships for that plant.

I delivered those castings to Mr. Gulick. I saw those castings after I delivered them to Mr. Gulick, because he returned some of them after they had machined them, they showed some blow-holes, and we replaced them, several like that. I don't remember how many castings we made; several sets there; probably eight or ten; something like that; I couldn't say. There were more than one batch of castings made; I don't remember whether two or three of them; but there were blow holes in them, and then we would make good castings; they were just for replacement.

Mr. McCoy: Direct examination closed.

Mr. Bruninga: No cross examination.

(Adjournment taken to the following day.)

(Thereupon at 9:30 a. m., Thursday, February 2, 1933, the hearing was resumed.)

FRANK U. WINCHESTER, a witness called by Plaintiffs in rebuttal, who, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Frank U. Winchester; age 46. I live in Lansing, Michigan, 517 West Main Street. I am at present Sales Engineer for the Motor Wheel Corporation. They are primarily wheel manufacturers. They do contract stamping business and specialize in brake drum production. It has to do with automobile accessories.

I know Edward J. Gulick. I first became acquainted with him in the spring of 1914. He had a job open for superintendent of design of a sleeve valve motor. Through Mr. Randall, who was connected with the Amplex at that time, they got in contact with me and made arrangements for me to come down there and go to work. That was at Mishawaka, Indiana. Originally that firm was known as the American Simplex; there was a conflict with an eastern concern; so I believe they changed the name, shortened it to Amplex; but that was long before I went there. My position at the Amplex Company at that time was chief draftsman. My supervisors there were both Mr. Gulick and Mr. Randall. That was, I would say, the latter part of April or first of May, 1914, but I haven't any definite record. I was with the Amplex Company until the time they went into receivership, which I believe was around some time in November, 1914. I haven't any definite way of placing the date of that employment. The only thing I can say; I know that I came from New York east with the Reo a short time, a week or two when Randall called me up and asked me to come down there. I know that was March. I was with the Reo only a short time, two or three weeks; then went with the Randall people. In connection with leaving, I do recall of leaving there to get married on September 15, 1914. I remember I was broke a short time after that; so I think that was November; the early part of November or middle of November; just about that time the deer season opened in Wisconsin and I went deer-hunting.

The sleeve valve motor which Mr. Gulick was designing was entirely different from anything I had ever

seen before, in this respect, that it was a sleeve valve type of engine. The sleeves were, I might say, semi-cylindrical, half-round sleeve; they operated at quarter crank shaft speed instead of half crank shaft speed, as is customary with the Knight type of engine. In this particular design the sleeves did not contact with the piston whatever; there was an extra large cylinder that went in from the top of the cylinder casting proper, and these sleeves operated between the cylinder the piston ran in and the water jacket or water jacket portion of the cylinder. There were two sleeves in this engine, the inlet sleeve and exhaust sleeve. There was an eccentric shaft on both sides of the motor; one operating the inlet valve sleeve, and the other operating the exhaust valve sleeve; I would say like a T-head engine. The motor was new all the way through; required a lot of study; the crank was peculiar to itself; and as I recall, there were seven bearings—I might be mistaken; the eccentric shaft was quite a job to design and properly timed, to get these parts to operate at the proper time, and the piston rings, that were used in the pistons were something that I had developed and had been very successful with in racing a few years previous to that, and the piston itself was an entirely new design as far as I know. I recall the structure of the piston; it was separate, what you might call a separate head piston, the skirt was separate from the head. There were some of those heavy ribs run down from the head of the piston to the piston bosses, and the return was a continuation of that, tied to the supporting skirt; that skirt was split in a diagonal line, probably about five to ten degrees, the idea being that we could fit the piston tight, or approximately size for size of the cylinder, and eliminate to a great extent the possibility of slap in the piston against the cylinder wall.

Mr. Gulick proposed the design of that piston and I worked with him. He gave me a sketch of his on it, which of course, was a rough, free-hand drawing, and it then had to be worked out to as close as we thought could be produced commercially, and that was my job, to work that out and oversee that the drawing was O.K. The features of the piston that were worked out were the separating of the skirt from the head and the splitting of the skirt to take care of the expansion that normally takes place in a solid body. We believed the splitting of the skirt would eliminate the expansion of the

piston, causing the piston to seize to the cylinder. That is, we believed it would take up that expansion because the piston has to be loose. We put that slot in there to eliminate the possibility of the piston sticking in the cylinder and prevent slap. All of that information was disclosed to me by Mr. Gulick, and we worked it out together. In a case like that a man comes to you with a sort of free-hand sketch, which is not to scale or anything, and you have to take that idea and work it in with the design you are working up. It is more or less studying out the details of the design for that particular engine, and I say that was my job, to work that out, and we consulted on the thing a lot and made our ideas agree, and finally produced a drawing that was satisfactory to Mr. Gulick, and called it a day with that. The drawing or sketch that Mr. Gulick showed me was a free-hand sketch, usually what you get; I am sure that is what he gave me at the time, just a rough, free-hand sketch without any dimensions on it at all, just giving an idea of what he had in mind. I wouldn't be able to tell what character of paper that sketch was made on; I don't remember. I believe I would recognize that sketch if I saw it again.

We finished the drawings at that time, finished the details of the drawing, made details, so something could be made from the drawing; then later they were traced to make a permanent record. I would recall those drawings if I saw them again; I saw them being made. I supervised the men who worked on the details of all of this. I made some of the details; other people made other details. The piston was worked on by Bert Rockhoff. I don't recall whether Bert Rockhoff was there when I went to work for them or not, but he left a short time before I left; it might have been a month or two months before I left, when he went, but I don't know.

I had other drawings besides the detail drawing of the piston; we made assembly drawings of the motor; we made a front section through the cylinder, showing the valve mechanism, sections of the piston, and heads, and all that, and the customary front view section of the motor. I distinctly recall making the assembly drawings, personally. I would recognize that drawing if I saw it again. I do not know where these original drawings are at the present time; I don't know anything about them; they were all left with the Ampler people, at the time of the receivership.

Q. You have stated that you could probably reproduce or make a drawing of the piston that you have mentioned in connection with those drawings. Now I will ask that you do that and take these pieces of paper and reproduce as best you can the character of piston that was disclosed to you at that time.

(Thereupon a recess was taken and the witness made six sketches on five sheets of paper.)

Mr. McCoy: The witness has produced a series of sketches marked for identification as Plaintiff's Exhibits 35A, 35B, 35C, 35D, and 35E, the figures being numbered consecutively from 1 to 6, inclusive, in the order in which they were produced.

(Narrative continued) Figure 1 of Exhibit 35A is a section cut through the center line of the piston showing the bosses that carry the piston pin, and these bosses that carry the piston pin are tied to the head with a series of ribs. In other words, they just hang down from the head and tie to the head with some ribs.

The piston bosses 1, are tied to the piston head 2, by a series of ribs 3. The skirt of the piston, that portion below the head, is separated from the head by the continuous cut or slot which in turn is tied to the piston pin bosses. The skirt 4 is tied to the piston bosses, with ribs, as a means of supporting the skirt, carrying it up and down with the rest of the piston. The ribs 3P are at right angles to the axis of the wrist pin, and they reach vertically up to the piston head.

The ribs 3P are shown running right straight across here (indicating on Figs. 1 and 3). The ribs 3P shown on this sketch Fig. 1 and Fig 3 extend across the piston from one side to the other. It is on this main rib that the piston pin bosses are tied to. You see, the ribs are together there, and they make a kind of T-section there; it is pretty hard to separate the ribs because they are not separated; to say that one rib does one thing and another rib does something else is rather confusing to me, because the ribs are tied together, making a T-section out of it, one rib reinforcing the other rib.

The skirt portion of the piston is tied to the piston bosses by ribs 7. Now, there is a rib right up in here that doesn't show, and it is awful hard to show; it is a continuation of this rib here, that comes over to that skirt and carries up there. I don't know whether you would call it a part of the rib 7 or whether you would call it a portion

of this 3. There is another section over here, you might call—this is 3, 3P, you could call this rib over here 3R. The numeral 6 refers to a slot in the piston skirt, 4. That slot is located 90 degrees around from the center line of the piston. I don't recall whether it was on the thrust side of the piston or not. The thrust side of the piston is that side of the piston which on the power stroke carries the load of the exploding gases, and on account of the connecting rod being on an angle and shoving the piston to one side against the cylinder. There was only one slot 6 in that piston. The slot went all the way through the skirt, from the top of the skirt to the bottom of the skirt.

The numeral 5 refers to a slot that separates the piston head from the skirt. The indentation 8 at the top of the skirt was put there for the purpose of collecting oil in that groove, and that oil was collected in there with the idea of leading the oil down through a pipe, marked 9, for the purpose of lubricating the piston.

As I recall, the pipe for admitting the oil to the wrist pin was inserted from the top of the hole 10 at groove 8, and extended down into a corresponding hole 11 in the piston boss.

Hole 11, shown in the bottom of the piston pin boss, became necessary because it was the only practical way to drill through this boss and also make this hole 10. (Witness applies corresponding numerals to other figures.)

The head of the piston was smaller than the skirt of the piston to allow for expansion when the head was hot. The piston skirt proper, I would believe, would have been about .002" under the standard cylinder bore. For instance, if it was a 3" bore, the piston skirt would have been 2.998.

It was generally known up to that time that expansion takes place in pistons of internal combustion engines; those pistons have always had to be made up to that time rather loose to take care of the expansion, to prevent the piston seizing when the piston was hot. It was cold pistons to a great extent that caused what we called piston slap, when the engine was cold; and the thought back of this piston, especially the splitting of the skirt and fitting of the skirt snugger to the cylinder bore, was to overcome the looseness that had to be incorporated in the other design of piston or the conventional design of piston, and the slot was primarily to take up the expansion of that metal caused when the piston skirt

would normally expand, which would create a certain load against the cylinder walls. This piston being a light skirt, we believed the skirt would sort of collapse or still fit the cylinder 4 at about the same fit as it fitted it when the engine was originally assembled. That was the theory of it.

There was not much of a load imposed upon that piston skirt; I couldn't give you the figures offhand. There would be a light load on that portion of the piston.

The wrist pins are mounted in that piston just a free fit in the piston bore, they being steel piston pins running in cast iron, as was considered good practice. I believe we made that piston of cast iron, and it is the reason why the section is shown so light.

(Narrative continued) I don't recall that Mr. Gulick told me anything about the nature of the material that he desired to make that piston from. We marked the drawing "cast iron" and made it that way.

The man who made the detail marked the drawing as "cast iron." At that time I had no experience with aluminum pistons.

Q. Do you know whether or not the question of aluminum pistons was discussed in your presence at the Amplex Company?

Mr. Brewings: I object to that as leading.

The Master: He may answer.

A. Yes.

(Narrative continued) Gulick discussed the question of aluminum pistons, and I believe had patterns fixed up to have some pistons made right across the street where there was an aluminum foundry. I don't remember what the name of the foundry was, but it was run by a Mr. Reinhoff; I don't recall his first name. That foundry was a small one where they made aluminum and brass castings.

We called the sleeve valve motor of which I have heretofore testified, the E. J. Gulick sleeve valve motor. In the event the drawings referred to that particular motor, they would be marked "E. J. G. Motor." I don't know whether they had the name; I believe they had the name "Amplex" on them, "Mishawaka, Indiana." All the drawings had the date on them. If the prints were taken from the original paper drawings, those initials would indicate the name of the man who originally made the drawing; and in lots of cases the same man traced

drawings, until it would show his initials on the tracing; also be the date on there, too. The date on the paper drawing, of course, would be applied as soon as the paper drawing had been finished. The date on the tracing was apt to indicate a later date than the original drawing was made. The placing of the date on the tracing, of course, would depend on how busy we were. In some cases tracings were made right after the original drawing was made, and then dated. In other cases where you can provide the shop with necessary information from a paper drawing and do not have the man available to make a tracing, it might be elsewhere, oh, perhaps two months to a year later the tracing would be dated. I do not know the time that elapsed between the making of the original drawing showing the piston reporting which I have testified and the time when the tracing of that piston was made. The date that was placed on the tracing would be determined by the time that the man finished the drawing. When he finished the drawing, he would put his name and initials on the drawing right then.

Exhibit 35 is a drawing, not a tracing. A tracing might have today's date on it. You can't blueprint on that.

The Master: I understand the difference between a tracing and a drawing. A tracing is on a piece of cloth, a piece of transparent cloth.

The Witness: Lots of times there was a date on that, showing when the drawing was made and the date when it was traced.

This series of blueprints marked Plaintiffs' Exhibit 30 are the sleeves for the auto job, for the cylinder. These are the valve sleeves. Referring to drawing A36, these are the sleeves that open and close the ports to let the gas in and out. A 60 is the crank shaft. All of these prints bearing the initials "F. U. W." I personally prepared the drawings on. Bert Benhoff prepared the main prints. I recognize the difference in the drawings, too. These drawings were made in the engineering department of the Ampico Motor Company at Middletown, Indiana in the spring and summer of 1914, probably up to the time of the receivership. I do not know where the originals from which these blueprints were made are located; I have not seen the original drawings or tracings since I left Middletown.

I recognize the blueprint marked "Plaintiffs' Exhibit 31"; it is a print of a section through the cylinder

showing the sleeve mechanism, a section through the engine showing the sleeve valve mechanism, piston construction, eccentric shaft, crank shaft, location of oil pump, method of distributing the oil over the crank shaft. I made this drawing before the details were made. That was made probably in June or July, 1914, at the Amplex Motor Company at Mishawaka, Indiana. This is the drawing that I referred to earlier in my testimony as being a front sectional view of the engine.

As to the numerals on the drawing, 1 indicates the head of the split skirt piston; 2 represents the skirt separated from the head of the split skirt piston; 3 represents the ribs tying the piston pin boss and the skirt. Evidently this design of rib continued up to the piston head. 4 represents the capscrew used for clamping the piston pin to the connecting-rod, the piston pin being free to rotate in the piston, in the piston bosses. I don't know whether that "A" refers to the split in the skirt or whether it refers to this little relief here that we made for catching the oil; I think it refers to this little groove here for catching the oil, (indicating oil groove at the top of the skirt). And it was from this groove that we carried oil down through the small brass or copper pipes to the piston pin boss for lubricating the piston.

The blueprint marked for identification "Plaintiffs' Exhibit 32," detail of the piston, is a copy with detail dimensions on, of piston shown in this Exhibit 31, and that shows ribs referred to in the previous testimony tying the piston head to the piston pin bosses, and it shows a slot cut at a point just below the piston pin to separate the skirt from the head; I mean below the piston rings, to separate the skirt from the head. The other sectional view is at right angles to the piston pin, (referring to the left hand figure of Exhibit 32). It shows the ribs that came down from the head to the piston boss, going down to a rather small section and then spreading out to grab and stabilize the piston skirt. This piston detail also shows an enlarged view of an oil groove just at the point of the separation of the piston head and the skirt. This is the groove that has been referred to in the previous remarks, that collected oil which in turn was carried down through a copper or a brass pipe and the holes drilled in the wrist pin bosses of the piston for lubricating the piston pin. In these piston pin bosses the section of the drawing, at the right hand side, shows holes drilled through a boss which continues up through the, you might say, the top half of the piston pin boss. I

am sure the reason of the hole being in the bottom here was because of inability to drill the hole in the top of the piston pin boss from any other point. When the piston pin was assembled into the bosses, this hole was naturally covered up, the hole coming down here and lubricating from the top of the hole. I don't know what this 4 is, but this is 11, and naturally because of the way the ribs are put in the piston there, the holes had to be offset at a little bit of an angle to keep from cutting the heads out, from drilling them through. The numeral 10 is applied to the hole in the bottom boss. I don't know what that hole is there for. It occurred to my mind that we didn't make this pipe go into the hole in the top of the piston pin boss; all the pipe was, was just sort of a drain pipe, to supposedly let the oil drip into there to lubricate the piston pin.

I don't know what the numerals in pencil at the bottom of the right hand view of the drawings 3A and 3B are, but I would say they refer to the rib that, in the left hand view, comes down from the cylinder head and ties to the piston pin boss, and then goes over to the piston skirt to tie the piston skirt to the piston pin boss.

I spent considerable time on the drawing of these details. This was quite a new proposition and there was a lot of conversation before anything was done on it. I wouldn't attempt to say how much time was spent discussing it; I suppose there was time enough spent on the thing to get the idea through my nut.

(Thereupon adjournment taken to 1:30 p. m. of the same day.)

(Narrative continued, pursuant to adjournment) An inspection of Plaintiffs' Exhibits 31 and 32 has refreshed my memory with regard to Plaintiffs' Exhibits 35A, B, C, D, and E, as far as design of this particular rib referred to as No. 7 is concerned. I just don't remember how that rib came around in it, and that is what is different between this sketch and the drawing, as far as I can see. This rib, 7, also ties from the piston pin boss to the skirt, but in a different position than the rib on the exhibit that I saw.

Q. Which is the position of the rib 7 as you saw it in 1914, as you recall?

Mr. Brumbaugh: I object to that, your Honor. These two are sufficiently unlike—it is a rather peculiar question to ask this witness at this time.

Mr. McCoy: Well, the witness has testified that the drawings refreshed his recollection.

Mr. Bruninga: It is also true that he did not make the drawing, Exhibit 32.

The Master: The drawings speak for themselves, don't they? I think that is objectionable. The witness has drawn this from his recollection as he now recollects it. He then goes to the drawing and sees something else. You can't change his recollection. You have put his recollection there, and I don't know how you are going to meet that situation.

Q. Will you again refer to Plaintiffs' Exhibit 32, the blueprint, and tell whether or not you saw that drawing being made?

Mr. Bruninga: I object to that as leading.

Mr. McCoy: The witness has identified the initialing at the bottom of the drawing.

Mr. Bruninga: Why shouldn't he identify the initials when he knows what those initials mean?

The Master: Suppose he did see it being made?

Mr. McCoy: Trying to prove the authenticity.

The Master: Well, he has already answered as to that print, and the other witness testified as to that.

The Witness: Yes, I supervised it being made.

(Narrative continued) The man that made the detail of that drawing, Mr. Boekhoff, was responsible to me, and I kept him in work in that organization. I didn't tell him what to put on the drawing; he worked from the lay-out, and I made the lay-out personally.

Mr. Bruninga: I would like to interpose an objection unless the lay-out is produced.

Mr. McCoy: The lay-out is shown as Exhibit 31, and is the lay-out.

Mr. Bruninga: Of course I want to object to that as being secondary evidence; the original has not been produced and it has not been shown it is lost, except by the witness, who turned them in and doesn't know anything about them since.

(Narrative continued) The dimensions that appear on this drawing, Plaintiffs' Exhibit 32, were determined by common practice relating to the expansion of metal in a heated cylinder. I determined the limits on the

details of the piston. Probably Mr. Gulick assisted me in determining of the dimensions of the piston shown in Exhibit 32, from time to time; I don't recall that he laid down any straight law on it.

In making the lay-out and drawing, Plaintiffs' Exhibit 31, we knew the bore and stroke of the engine Mr. Gulick wanted designed, and having that information, and our past experience connected with motor design, the balance of the information was worked out from past practices together with information Mr. Gulick had that he wanted incorporated in the design.

Mr. Gulick gave me a sketch, or free-hand sketch, showing the general idea of what he wanted in the way of a piston.

Q. I show you a paper—

Mr. Bruninga: Just a minute before you show that to him. This witness, I am quite sure, stated recently that this particular sketch, these particular sketches 35A-B, were developed in accordance with instructions given him by Mr. Gulick, and my position is that that sketch, that I have seen before, this proposed exhibit that counsel wants to put in now, deviates considerably from them. I don't think counsel have the right now to do any more with that exhibit than what he couldn't do with Exhibit 32.

Mr. McCoy: May it please your Honor, this witness has testified that Mr. Gulick gave him sketches from which he made up his piston lay-out and typified in Plaintiffs' Exhibit 31, the general view, the details of which appear in Exhibit 32, and I am asking the witness now whether or not he recognizes personally the sketch that I desire to show him for identification, Plaintiffs' Exhibit 36, whether or not that was the sketch shown to this witness by Mr. Gulick in 1914 from which these drawings were made. It appears to me to be perfectly competent. These sketches 35A to E are the sketches that represent the recollection of the witness when he entered this court room. They weren't the sketches from which the witness made up the drawings that were made by him and under his supervision that he has testified to in connection with Plaintiffs' Exhibits 30, 31 and 32.

(Further argument had between counsel.)

The Master: I understand they are contradictory, if what is said here is true, but it seems to

me they are properly in this case, and the contradiction can be examined about or relied upon. If this paper, which I assume it is so claimed, was present at the time or he had it before him when he made his first drawings, it seems to me that is competent. I think I will let it in and you may save your exception. I think it may go in, taking the case as I am, as a Master, for that may be a very important question in the case, something the court should have before it in passing on this case, and I don't want to take the responsibility at this time of excluding it. You may have your exception. It is received over your objection.

(Narrative continued) It is my opinion that Plaintiffs' Exhibit 36 is the sketch that I worked from in the design of the piston for the Gulick sleeve valve motor. I probably saw that paper, Exhibit 36, for the first time when I went to work there, at the Amplex plant, when Mr. Gulick explained to me what the engine was all about. I would say in the spring of 1914. Mr. Gulick gave me no other information to work from in connection with the drawing of the piston, that I recall.

Q. Was the drawing that you have examined, marked Plaintiffs' Exhibit 36, the only information received from Mr. Gulick in connection with the design of the piston for that motor?

Mr. Bruninga: He has just answered that that is all the information he had. Now counsel is trying to dispute his own witness.

Mr. McCoy: I am not disputing the witness. The witness knows what he is talking about.

The Master: I think as long as he has answered I will sustain the objection and let him offer to produce it, and let it be included in the record so that the court will have it.

(Further argument had.)

The Master: I will overrule the objection and you may have your exception.

(Narrative continued) That is not all the information that I have had from Mr. Gulick. In the process of the design of a motor of this type that was very new, the matter was discussed from time to time, and may be discussed one week and then again at some later time. There is no question in my mind that the discussion of the whole job lasted over a period of three or four

months, and in that time I probably was instructed more than once about details of the type of the engine, including the piston or any other detail. All the instruction that Mr. Gulick gave me was practically all verbal; I don't recall whether I had written instructions or not. I won't say I didn't receive written instructions.

I don't believe I would recognize Mr. Gulick's handwriting at this time.

Bert E. Rockhoff, who worked under my supervision at the Amplex Company, had a brother working in his father's foundry across the street, in Mishawaka, at that time. I don't recall his brother's name. In addition to Mr. Rockhoff, I had a man by the name of Middleton, I believe, working under my supervision at that time—that is all I can remember.

At that time, the other people working at the Amplex plant, that I remember, were R. W. Randall, who I believe was supposed to be general manager, factory manager; there was a man by the name of Byerley, who was a tool engineer. Now, there was a man by the name of Mulrine, Fred Mulrine, who did what we would call outside testing, building up a chassis in outside testing work. A man by the name of George Young, who was a kind of general, all-around man at that time; he mounted bodies on the chassis and sort of finishing-job man, getting it ready for the road. I am afraid I don't recall any other names.

We had a tool room in a corner of the shop, a small one; I suppose there was someone in charge of the tool room; I don't recall who he was. We had a stock room out at the back end of the plant. The only fellow I know in charge of that stock room, as I recollect, who I think was named Brown. I couldn't say as to whether or not his name was Ed Hoadley. A man by the name of Johnson was the tool room foreman at the time I was there.

As to Plaintiffs' Exhibit 32, the detail of the piston, as the design and lay-out was started before I went there and I finished up the lay-out and I left there in November, and this work was all carried along in the same time, I can't check up the length of time that particular detail was worked on or any other detail. I was thoroughly familiar with that piston structure at the time I was supervising the preparation of this drawing.

Q. And yet you were unable to recall the exact piston structure when you were asked to make a drawing in accordance with your present recollection. A. It is twenty years now.

Mr. McCoy: Direct examination closed.

The Master: When did you go to work at the Amplex?

The Witness: I went to work in either April or May of 1914.

(Thereupon adjournment was taken to the following day at 9:30 a. m.)

Cross Examination by Mr. Bruninga.

I came to the Amplex in the spring of 1914. I had had experience in automobile manufacturing, or manufacturing of parts of automobiles before that. I did not keep track of all the automotive magazines. I read magazines. I did keep track of "The Horseless Age"; that was a popular magazine at the time. I don't know whether or not I subscribed for that magazine at the Amplex Company that year.

I did not see the article in The Horseless Age of April 8, 1914, Exhibit 4-M, the Herschell-Spillman crosshead piston; this is the first time I have seen that article.

In Exhibit 35-A, Fig. 1, there should be a line at the right corresponding to the line directly opposite the arrow on the lead line 5, the same kind of a line. As a matter of fact that rib 3-R should have been moved over on the sketch. Those are for the insertion of the wrist pins. It is my recollection that the webs 3-R and 7 are interrupted at the point opposite the holes, but they actually weren't that way; that is a continuation of this rib here (indicating). I say that because of the sketch I saw yesterday; that changed my recollection. I wouldn't say it is not like Exhibit 35 at all; it is not like it in that you have only one rib 7 below the wrist pin boss, or a single web construction below each wrist pin boss. (By web construction is meant webs extending practically across.) My memory is a little faint on that.

I saw that drawing, Exhibits 31 and 32, last in 1926. The occasion for that was Mr. McCoy, I believe it was Mr. McCoy, took a deposition of me in connection with some other patent litigation, some other concern. I didn't actually go on the witness stand then, but I was shown those drawings and expected to be called as a witness then. I looked the drawings over thoroughly at that time. I did not see those drawings before this session, the last time, I believe, being in 1926. I didn't examine them thoroughly, except to recognize them as prints I was familiar with. This Exhibit 35, the draw-

ing that I made, was my recollection of what I thought it was in 1914. I didn't think of what I saw in 1926. I tried to recollect what I knew in 1914. When I made this sketch, I never thought about what I saw in 1926. It escaped my memory that I had seen these drawings in 1926, but the minute I laid my eyes on those drawings I got a different picture in my mind. I had worked on those drawings in 1914. I looked at my initials on the lower right-hand corner of the cross-sectional view, Exhibit 31, and recognized them. I wrote my initials in the regular way; they are written in my own handwriting. I am very positive that that Exhibit 31 is a blueprint of the drawing that I made, that is, the large cross-section.

On my direct examination I remembered all the other details of the particular way that those valves were made on that engine, the two valves instead of being in one piece, two half pieces sliding, I remembered the crankshaft, I remembered the eccentric shaft, and I even remembered the piston ring, before I proceeded to make this sketch. I couldn't reproduce them in detail from memory, but I could have reproduced them in general structure.

I remember having made this cross-sectional drawing, Exhibit 31, because that is the only thing I worked on when I was at the Amplex. I made that particular figure because my initials are on the corner, and I remember what I did there. I also remember what I did as far as the piston is concerned, the exact structure as shown in those two drawings. I didn't make Exhibit 32, the piston detail; I made the lay-out, showing the section. Exhibit 31 is the lay-out, the long view.

The connection between the head and the wrist pin on Exhibit 35A is very close to that as shown on piston B, but the connection to the skirt is not the same. When I made sketch, Exhibit 35-A, I didn't remember just how the wrist pin bosses were attached to the skirt, but I did remember the detail of the oil tube going to the wrist pin bosses. I also remembered the detail of the groove 8 at the top of the skirt. I said that I wanted a snug fit of the skirt into the piston, but free enough to slide up and down; I did not say that a snug fit was one that had about .002" clearance, a snug fit is size for size, known as a ring fit. A ring fit and a snug fit are practically the same thing. I think you can slip a ring fit in easy.

There are three kinds of fits, a tight fit, a loose fit and a snug fit. A tight fit is usually referred to as a press

fit. The .002" clearance was my idea of what I might say was a snug fit for that diameter piston; in other words, it wasn't a sloppy one.

When I said that initialing drawings two months to a year after the original drawing was made, I referred to general practice, depending on how busy we were.

In referring to the cross-sectional layout, Exhibit 31, I referred to the ribbing attaching the piston head to the bosses when I said: "This design of rib evidently continued out to the piston head." I don't remember any particular reason for using the word "evidently."

I think I will correct myself on saying that a man by the name of Middleton was at Amplex at that time, because I think Middleton left before I went there in 1914. I am uncertain whether he was there.

Mr. Gulick was at Amplex when I came there, in the spring of 1914. He made arrangements for me to come there.

I thought there was another man, an additional draftsman, there outside of Rockhoff. I was trying to think whether there was or not. I recall Bert Rockhoff very plainly. We didn't have very many draftsmen, and I am not certain whether we had others or not.

Both Mr. Gulick and Mr. Randall got me to come to the Amplex Company.

When I said I was chief draftsman, I meant I had supervision of the drafting department, regardless of how many there were there.

Mr. Rockhoff made the detail drawing, Exhibit 32, from the lay-out, Exhibit 31, together with instructions from both Mr. Gulick and myself. Both Mr. Gulick and I gave Rockhoff instructions, how to proceed after we had given him the lay-out.

.002" clearance in a cast iron piston was a pretty close fit for a piston. Perhaps there were pistons being used that had a .002" clearance, I don't know.

I have been in Cleveland on this visit since Tuesday morning, January 31st. I have not talked with any of the attorneys in this case, about this case, except as they have notified me to come down here. I have not talked with anybody else about these drawings since 1926 until I came here to testify. I was shown those drawings in 1926; I recognised them then and I again recognised them today.

My expenses here have not yet been paid, but I have been promised my expenses. I expect to obtain something for my services here, but I have made no definite

arrangements; I don't know what to charge, I have been kind of mulling that over.

I am now employed as sales engineer for the Motor Wheel Corporation, working on a salary. I have been gone since Monday night, and I am being docked while I am away. I expect to get at least what I am being docked, but would like to get more, but I have told no one connected with this case about that. I understand I am going to be compensated for loss of time; I have that in a letter from the attorneys in the building downtown, but I do not have that letter with me. I think that is no more than right that I be compensated for my services, time and expenses while I am away from home. No honest man would let that affect the truthfulness of his testimony. Engineers like to be compensated for their time.

Mr. Bruninga: That is all.

RALPH MURPHY, a witness called in rebuttal by Plaintiffs, who, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

By Mr. McCoy: Before I examine this witness is it all right with you, Mr. Bruninga, if we let the record show that the pistons and drawings were covered up for the witnesses Randall, Bert E. Rockhoff, William Rockhoff, and Mulrine?

Mr. Bruninga: I think as to all the other witnesses they were covered up on both sides, except of course Mr. Spellman and Mr. Jeffries.

My name is Ralph Murphy; age 55; place of residence Syracuse, New York. I have no occupation right now. My last previous occupation was vice president, H. H. Franklin Manufacturing Company. During the period of 1913 to 1920 I was chief engineer. Previous to that, various positions in connection with engineering. Subsequent to that position as engineer, manufacturing and sales, general business outside of financial.

The Franklin Manufacturing Company maintains laboratories for testing of engineering problems, under the supervision of the chief engineer. They were under my supervision during the time that I was chief engineer for the company. Reports were kept of the activities of those laboratories. These reports were weekly reports turned in every week, which kept a running account of various activities during the preceding week, and then

there were occasionally special reports covering some special subject. The purpose of those reports was to supply information to various people and to also enable myself and the parties with me, to bring special facts to mind, if you would read the report some fact might come out that you might have overlooked.

During the period from 1915 to 1920, in general, there were three people prepared those reports: Mr. Forsythe, Mr. Williams and Mr. Stellman; there might have been a few reports by someone else, but those were the main three.

The new things that came to the Franklin Company during the period 1915 to 1920 were submitted to us, where they were as a rule discussed and gone over. If we considered them worth while, we would go ahead and test them out.

We had quite a few problems of various kinds that we were testing out between the period of 1915 to 1920. During that period the main problem was pistons, outside of that there was what you might call a miscellaneous assortment of minor mechanical problems, but that was the major problem.

I had a great deal of test work done under my supervision on pistons during that period from 1915 to 1920. We tested the so-called Long piston. The first Long piston that was submitted to the Franklin Company was an aluminum alloy piston with four vertical and one horizontal slot in the skirt, and with an internal web at right angles to the wrist pin running down one side of the piston, being cut off, but not extending down the other side. The rib was arranged at right angles with respect to the wrist pin bosses; it didn't touch them, it ran up the skirt toward the head, at right angles, halfway between.

I have examined the Franklin mechanical reports recently with respect to that piston. There were drawings that showed that type of piston, but I haven't got them with me. (Counsel shows photostat P-2012 Plaintiffs' Exhibit 43 to witness). Yes, that is one. The first test we made of pistons of the character that I have just described was in July of 1918.

Mr. Brannigan: I object to this paper produced as not being an original; it is a photostat.

Mr. McCoy: Well, the witness has described the structure.

(Narrative continued) I do not know where the original drawing is from which this print was taken. I

don't know that that is the drawing of the original piston, but the original piston is that type. By "type" I mean the things I have mentioned, that it has these four vertical walls, these two there, these two here, and this one horizontal, and this internal ribbing down one side and not down the other side. In regard to the slots, that is pretty much a matter of memory. In regard to the rib, that is partly from my memory and the record of the test men.

I can't say when I first heard of Mr. Long. He was a dealer there. The first I heard of pistons that Mr. Long was offering to the Franklin Company was in the spring of 1918, April or May; I think probably it was in May.

Mr. Long wrote Mr. H. H. Franklin, the president of the company, that he had some piston ideas and development that he would like to take up with us, and Mr. Franklin replied and told him that of course we would be glad to know whatever he had and the best thing to do would be to send us a sample or some descriptive matter, or something like that, and I believe Mr. Long replied to him and then after that, these letters, or the matter was referred to me, and I wrote Mr. Long and asked him to send us a sample of the piston he was talking about. We got a sample such as we requested. It was the type I have just described to you, of the type shown in photostat marked P-2912. I have recently seen the original letters referred to by me. I can produce them. (Witness does so.) Here is Mr. Franklin's letter. (Witness produces a photostatic copy of a letter dated April 17, 1918, addressed to E. C. Long, and signed by H. H. Franklin, letter being written on the stationery of the Franklin Automobile Company.) Here is the letter I wrote, dated May 9, 1918, addressed to Mr. E. C. Long, and signed by R. Murphy.

At the time of the writing of those letters, we were experimenting with pistons right along, and were anxious to try out new piston structures. We had been experimenting for some time prior, which work was practically continuous during that period. We experimented with pistons in 1916.

Mr. Long submitted another piston of a different construction to us in March, 1919. The characteristics of that piston, that differentiated from any other we had, as I remember it had six vertical slots, two horizontal slots, and internally there was a web extending across each wrist pin boss and at right angles out to and integral with the skirt.

Referring to Long Patent 1,872,772, that is the type of piston Mr. Long submitted to us. In March 1919 we put a set of these pistons on an engine and run the test on the block with it; it wasn't very satisfactory. A set was put in a car and run on a road test by Mr. Stellman; I believe Mr. Long was with him. During this first test the piston set up, frose the cylinder.

The very first test in 1919 of a piston shown in the photostat marked P-2912, the piston frose in the cylinder and was pretty badly damaged. The first sample was one piston. We continued to test those pistons through 1919, whether and to what extent we did in 1920, and beyond, I don't recall.

I don't remember any other piston structures different from the piston structures shown in photostat P-2912 and the patent 1,872,772 during that general period, up to the time stated, March 1919.

I don't remember Mr. Long submitting any changes in the piston shown in patent 1,872,772, though I have no doubt but what he did submit changes.

Mr. Bruninga: I move that answer be stricken out.

(Narrative continued) I would recognize copies of the reports of the tests made at the Franklin Company.

Q. I hand you a series of papers. Will you tell whether or not any of these reports that are handed to you relate to piston tests made under your supervision?

Mr. Bruninga: Before the witness answers the question I would like to have it shown what he knows about the tests, unless they were made by him personally—

Mr. McCoy: Well, this witness has testified the tests were made under his supervision. He got these reports made to him at the time the tests were completed, and they kept him informed of what was going on in the laboratory.

Mr. Bruninga: Let's see what he knows about these particular ones; that may all be. People are sick sometimes for two weeks; you are putting a lot of papers in his hands.

The Master: You want to examine these papers before he testifies?

Mr. Bruninga: No, I don't want to say that.

(Narrative continued) These are reports that were submitted to me. Here is a piston report of October 5,

1918, the tests of which were made under my supervision at the Franklin Company.

(Reading from report) "MLS0M" is the heading of the particular test called "Piston endurance run." "Special Long patented aluminum composition pistons. Weight including wrist pin, two pressure-proof junior rings, and one Inland top ring,—1.3[illegible]#. A full set of these pistons were installed in the regular series nine engine and fitted to the cylinders such that the straight skirt clearance from just below the wrist pin down was from .002" to .003". The bands were of .025" clearance just as they were received. It may be noted that there was four oil holes in the top of each wrist pin boss and also eight oil holes just below the lower ring. The engine, thus built up, was placed on dynamometer #2, fitted with tinware, as in a car, and the test was carried out according to the method described in MLS0M, so that results are comparable with those in that report. In this last test the pistons were installed in such a way that the ribless side was toward the exhaust side of the engine. The result: after ten minutes running, pistons 4 and 6 seized on the exhaust or ribless side of the piston. This test will be repeated with the same style of piston having a straight side skirt clearance of .003" and having ribless side of piston toward the suction side of engine. To build up the motor in this way and not be obliged to cut away the rib in order to make room for the connecting rod cap screw, the connecting rods will be turned to 180° and thus have their cap screw on the suction side."

This report was prepared by Mr. Forsythe. That report relates to the first Long type piston that we received. That piston structure is shown in Photostat Exhibit P-2912. I find in this exhibit the four oil holes in the top of each wrist pin boss referred to in the report. I would say this print shows 16 holes just below the lower ring.

Here is the rib R I spoke of that extends from the right-hand side of the plan view of the piston structure, over across the top and down to the left-hand side, but on the one side it doesn't come down here, it is cut off at the top. (Witness marks drawing with letter "S" to indicate ribless side and letter "R" to indicate rib.)

The report marked July 20, 1918 contains a reference to piston tests. This test is headed "MLS0N." "Piston endurance runs. A regular series nine engine was equipped as follows: (a) The new production

series gauge cylinders, (b) #1 cylinder was equipped with Long patented piston with no rib on exciter side, (c) other pistons were regular production magnalite having a clearance of .015" for a distance of 1½" below the bottom ring, and then tapering off to .025" at the skirt. The engine was then placed on dynamometer #1 and motored in for three hours at 1000 r.p.m., and jackets were installed and a piston endurance run was made under the conditions described in report ML-2001. The run proceeded for 19 minutes when the power failed, thus taking the load off the engine. The horsepower did not drop sufficient to indicate a 'cut up.' After allowing engine to cool off to room temperature, a second trial was made and this time the run proceeded for 19 minutes when the motor 'cut up,' #1 piston 'cut up' so tightly there was a large hole in the top of the piston; two of the other pistons seized slightly on the exhaust side near the skirt."

There are some pencil marks on this report. (Witness reads from report) The part labeled "b" was originally "#1 cylinder was a special patented one with no rib on exciter side." In pencil it reads, #1 cylinder was "equipped with Long patented piston with no rib on exciter side." Then the part of the paragraph where it reads, "The engine was then placed on dynamometer #1 and motored in for three hours at 1000 r.p.m.," following that originally was "tinware was installed," and so forth; in pencil it is written "jackets were installed," and so forth. Then later down in the last paragraph "That the explosion pressure punched a" was substituted in pencil, "And there was a large." I don't recognize the handwriting in which those changes were made. This report was made July 20, 1918.

Another test which we made is reported as follows: "MLAX 10,000-mile wear test. This test was completed 4/28/19, and the following parts examined for wear"—I will skip down to where it starts about the pistons. "The Long patented pistons, with floating wrist pins and straight skirt clearance did not show excessive wear but one piston broke at 7000 miles and the retaining buttons and wrist pin holes had all worked loose, wearing down both the buttons and the wrist pin hole. One button was broken and one had the horizontal retaining legs entirely worn away." The rest of it is about cylinders and valve lifters. The date of that report is May 2, 1919. Here is a further reference to pistons. It is headed "Long patented pistons—purchase order

#35,500—type 'B.' 250 of these from pattern X-13 are on order at Walker M. Levett Company. To date 14 of these have been duly received. We are advised that shipment has been made of an additional 50 castings." The next paragraph is "Type (A). 100 castings have been received of our original order calling for 350 castings from our type 'A' pattern #P-2912. After receiving 65 castings we recalled pattern back from Walker Levett Company, this to enable bringing pattern up to latest blueprint; Upon completion, same will be returned them for the completion of our order."

This report relates to Type A and Type B pistons. Type A differed from other pistons in general in that it had four vertical slots and one horizontal slot and an internal rib extending down one side of the piston and not down the other. And the Type B piston was one in which there were six vertical slots and two horizontal slots with each wrist pin boss supported by a cross rib extending to the skirt and integral with the skirt.

Q. In other words the Type A is represented in the photostat P-2912 and the Type B is shown in the Long patent 1,672,772, is that correct? A. It is that type, it is not that piston.

Mr. Brunings: I object to that entire question as leading, particularly as to the type A. I don't think that the witness has identified that print as the type A.

(Narrative continued) There is one further reference to the piston here. The next paragraph is "Shipments. 6 Long patented pistons, Type A equipped with rings and wrist pins have been forwarded to our Detroit dealer, Mr. W. J. Doughty." The date of the report from which these abstracts have been taken is May 3, 1919.

In 1917 you might reasonably say they were running tests on pistons continuously, one type or another on tests.

During 1917 most of our experimental work was confined to our regular production type aluminum piston we were using in production. Outside of that I don't know if I can recall specifically what piston we were experimenting with.

We experimented with cast iron pistons. We experimented with the Wainwright pistons. I don't know that we were during 1917 especially, but we experimented with those pistons. Of course there were various others,

there were composite pistions, there was the Zephyr, what we call slipper piston, and Zephyr piston. In 1918 the tests were carried on practically continuously. The same thing applies for 1919. I would say 1918 was probably a little bit slower than the other years because we were doing a lot of war work and we had to use the times available.

These reports containing the subject matter that I have testified to were all made to me either on or nearly the date shown on the report.

Mr. McCoy: We will put in photostats.

Mr. Bruninga: You offer them in evidence?

Mr. McCoy: Yes, I will offer these in evidence as Plaintiffs' Exhibits 42-A, B and C.

Mr. Bruninga: Of course I object to the evidence contained therein as hearsay.

Mr. McCoy: I mark the photostat produced by the witness, referred to as bearing the number P-2912, as Plaintiffs' Exhibit 43.

Mr. Bruninga: Of course I object to 43, being a photostat, not the original, the original not having been produced, and it has not been shown that the original is lost.

Cross Examination by Mr. Bruninga.

I must have been chief engineer of Franklin from about 1913 to 1920, approximately. I do not know in what month I was promoted in 1920. My impression is it was in the spring of that year, but I am not certain. Mr. Stellman followed me as chief engineer, Louis Stellman, who is in this room. Mr. Stellman's job at that time was assistant engineer. His duties were as assistant to the chief engineer, and as such act, carry on all the engineering processes. Mr. Stellman would carry on some of the engineering processes; I would do some directly, he would do some directly. He had something to do with the piston development. He was in rather close touch with it. I would say he did more work on them than I did, but I don't think he was in closer touch.

I can't say when I first met Mr. Long. He was a dealer for some time before this piston matter came up. I might have met him sometime before, but I might not. He was in Quincy at the time when I first met him, according to my recollection. I remember Mr. Long himself stating he was in Quincy. I don't know when I first met him; I don't remember. I don't recall that I met him

before 1918. I don't recall whether I met Mr. Long before I wrote that letter of April 17, 1918 to Mr. Long at Hannibal, Mo. I might have seen that letter before or after Mr. Franklin sent it. He might have asked me if it was all right to sent it to Long before he sent it, or might not.

The letter states: "I have your letter of April 13 and note with interest that you have a patented piston which shows up well in tests." I assume that meant Mr. Long made some tests and had written Mr. Franklin that he had a piston he was testing. I do not know what piston that refers to.

I know how this piston shown in Exhibit 43 is constructed. We have had pistons similar to that; it may have been that piston as far as I know, but I am not sure it was all the same detail, but it was that type. I do not know whether or not it was that particular piston that was tested out. When reference is had to piston A, it meant that type piston, the type in the respect I was speaking of, having the four slots vertically, one horizontal, and the rib inside cut off on one side of the skirt.

I can't say that I remember the piston shown in Long patent 1,489,499. I would say it is quite different from the one shown in Exhibit 43. It has got an extra horizontal groove cut through, and you see that rib, the internal rib was entirely different. The internal rib is different by the fact that the webs are from the head instead of from the wrist pin bosses. I don't remember that piston specifically.

I wrote that letter of May 9, 1918. Long had sent us a sample piston that I asked for in that letter. That piston was the type shown on this print here, Exhibit 43. I don't know that it was that particular piston, but it was that type. When I say "type" I refer to the slot and the internal ribs.

Referring to Exhibit 43, I don't know who made the original drawing of which this is a photostat. It is specified as drawn by Clark.

Referring to Exhibit 42-B and particularly the report of July 20, 1918, the "Long cyl. steel body" refers to body structure of the Long steel cylinder. I don't know whose writing that is in pencil on sheet 3 of the report of July 20, 1918. I don't know whether that pencil writing was on there when I got the report. That must have been the Long piston, because it was on the piston without a rib on the suction side. That is the way I associate it because it states it has a rib on one side. Aside

from the records, I couldn't say that this particular piston was a Long, from memory, no. In that respect, my recollection is based upon that record. Without the record I would not remember the exact date or the exact piston of that particular time. The fact that it states it has no rib on the suction side is the thing that relates it in my mind to this type of piston, that, with the fact we had written Mr. Long for samples and had received them, but what connects it is the fact it is ribless type, ribless on one side. My recollection that it is the piston referred to in the report of October 5, 1918, is based upon page 2, sheet 3 of Exhibit 42-A. Special Long patented aluminum piston, slotted, and the reference to the piston having the ribless side; those were the two things. I don't find any notation of Long on Exhibit 43.

This drawing of July 9, 1918 is an experimental drawing. Why it was made, to be specific, I don't know.

I believe it is true that when we made that test of July 20, 1918, we made it on a piston sent us by Mr. Long. We might have made a drawing on July 9th because we might have had the piston. I don't remember if we made the drawing first and a test afterwards; I don't know. It might be unusual to make a drawing first and then make a test afterwards of a piston that a man sends us, and it might not; it is hard to say. That is not the usual procedure. I believe the piston we tested in July 1918, was one that was sent us by Mr. Long. The piston we tested could have been a piston that we made up ourselves from this drawing of July 9, 1918, Exhibit 43, but I doubt if that is what happened, because if after writing Mr. Long, for example, it seems to me we would have had a sample, and that is the first mention of the piston test on these reports, which conforms to my recollection of a Long A piston, my memory as well as the records. I should say that this Exhibit 43 piston was called an A type piston in the spring of 1919. I think we were still testing type A pistons in the spring of 1919.

I knew about the agreement between Long and Franklin with respect to aluminum pistons, Defendants' Exhibit AA. That agreement was entered into on March 20, 1919, as shown here, and it refers to an application, serial number 281,175; that serial number 281,175 corresponds to patent number 1,872,772, which was filed on March 7, 1919.

We would be experimenting with the Long type A piston as shown in Exhibit 43, when piston covered by patent 1,872,772 is mentioned in the agreement, because

we had been experimenting with it and had secured enough results so we wished to go on with the experiments. It had been satisfactory only so that we wanted to go on with the experiments.

At the time of this agreement, the 20th day of March, or about that time, Mr. Long had submitted a piston to us like shown in this patent 1,872,772, but we continued to experiment with the piston as shown in Exhibit 43, after that. I do not know why that A piston was not included in the agreement.

Those are my initials in the upper right-hand corner of Defendants' Exhibit Z. I do not doubt but what I read that report. I should say that is a type B piston, that is what we call a type B. This type A piston was shipped May 3, 1919, or the preceding week. It was not until March 1919 that we received a piston with six vertical slots, two horizontal slots, and with the wrist pin bosses supported by a cross rib going over to the skirt and integral with the skirt, that is, like patent 1,872,772. I don't remember how it distinguished from that patent; I can't remember any details that might enter in it; there might have been a little more metal here or a little less here, or a rib here and not there, etc.

I can't say that the piston I just spoke of differed at all from Exhibit F; it may have in some minor respects but not in general shape. Exhibit F is the piston that the report of March 18, 1919 refers to; that is the same type piston. By "type" I mean that it differed only in small details. It may not have differed there, but I can't remember the infinite number of little details. On some things I remember very plainly, others not so well. I have to rely on these reports in some respects, a good deal in regard to the date, I remember that to a certain extent.

If I said that in 1917 we were testing pistons continuously in production, I mis-spoke myself. I didn't intend to say in production. What I think, what I really said was that we tested a great many of the pistons, we ran tests on the pistons which were in production; we ran further experimental tests on those that we were using in production. That was done because the pistons used in production were not entirely satisfactory; we were looking for improvements. I think we ran tests on those pistons after we were using them in production, we kept on experimenting with them. It is natural to do that even for a year or so. I don't know what year we sent the Long pistons like Exhibit F out to the service men. I had nothing to refresh that date to my mind.

I recognize Defendants' Exhibit C. I don't know that this issued on April 8, 1920, but I assume it did, or within a day or two of it.

On page 2 of Defendants' Exhibit C, it is stated "After April 15th the service department will be able to furnish Long type pistons in the standard size. These are straight pistons with two or three thousandths clearance. Their weight is approximately the same as standard pistons." I don't recall that the service department supplied pistons for engines in service after April 15th, but I can recall that they supplied pistons for engines. I can't recall specifically when all of the pistons—in fact, they supplied more than one kind of piston from time to time. I believe Long pistons were supplied by service after April 8, 1920. I don't know that they were like Exhibit F. After April 8, 1920, my opinion would be it would be type B piston.

Mr. Stellman had a great deal to do with keeping track of the development of the Long piston. I think perhaps he had more to do with it than I had, in detail. I believe it was under his immediate supervision at that time.

I said that sometime in this period between 1915 and 1920 we were testing slipper pistons. I don't recall where we got them. During that period we tested Wainright pistons, we tested the Zephyr piston, I believe a Mooers piston, we tested some composite pistons with aluminum head and cast iron skirt, we tested some cast iron pistons, probably more than that but that is all I recall off-hand.

I don't recall what kind of vacuum tanks were being used on the Franklin car in 1918, nor do I remember who they were made by.

I don't know what kind of ignition system was used on the Franklin car in 1918, neither do I know what kind of speedometers they were using. I do not know the difference between a Stewart No. 2 and a Stewart No. 3 vacuum tank. I do remember what kind of a Long piston was used in 1918, and also taken from my records. I have to rely on the records to a certain extent, yes.

What the record says, plus what I remember of the piston, plus the drawing, goes together.

I arrived here in Cleveland Wednesday morning. I am going to send my bill to Richey & Watts for my trip over here, for expenses plus compensation for my time. I have investigated these Franklin records, and I expect to send a bill for the time spent by me.

Mr. Brumfinga: That is all.

Re-Direct Examination by Mr. McCoy.

I don't believe I can recall from my mind whether or not these facts that I have read from these reports into the record were true and correct as of the time when that report was given to me, aside from the records. I know that we were running these kind of tests all the time. I know that these things were under tests, but I can't remember back that time in my mind; no, I take the date from the records. Those records refresh my recollection as to the facts reported in them. I do not remember whether the first Long pistons of the type B were relieved over the bosses.

Mr. McCoy: The letter identified by the witness, Franklin Company letter addressed to Mr. E. C. Long and signed by R. Murphy, dated May 9, 1918, is offered in evidence as Plaintiffs' Exhibit 44; the letter dated April 17, 1918, addressed to Mr. E. C. Long, signed by H. H. Franklin, is offered in evidence as Plaintiffs' Exhibit 45; the reports referred to by the witness, marked Plaintiffs' Exhibits 42-A, B and C, are offered in evidence under the same numbers; and the photostat referred to by the witness is offered in evidence as Plaintiffs' Exhibit 43.

Mr. Bruninga: I object to the photostat, for the original is not produced, and it not having been shown the original is lost. That is not a formal objection, either, because the top of this rectangular part in the lower right-hand corner is so faint in some parts that the objection certainly is well founded.

The Master: I will receive it subject to proof as to the disposition of the original, or something so that it can show this can be read, this is not readable.

Mr. McCoy: Yes, your Honor, also the photostat is offered as the paper to which the witness has referred to refresh his recollection.

The Master: It may be so received to that extent.

Mr. Richey: And would of course also be competent as in the nature of a present day recollection drawing, in any event.

Mr. McCoy: That is all.

STEPHEN R. CASTOR, a witness called in rebuttal by Plaintiffs, first being duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Stephen R. Castor. I live at Jordan, New York. My age is 45.

I was employed by the Franklin Company, Syracuse, New York from 1916 until October 1918, and from 1920 to 1931. I just came there as a draftsman; afterwards chief draftsman; afterwards designing engineer. My clerical duties consisted of making out a drafting room report; it was incorporated in the big report, each department of engineering submitted their report. Those reports were referred to me; they weren't referred to me directly, they went to the stenographers and were written up, then the stenographers worked under me. When I received the reports they were filed away under the custody, ordinarily, of the head stenographer. She was under my supervision as long as I was chief draftsman or designing engineer.

I was acquainted with the experimental routine of the company over a period of a good many years, that is anything that was developed in the experimental department, why, we would have the job of designing it and putting it into drawings and records of the same. I had that duty between the years 1916 to 1918, inclusive, that is, up to October 1918, when I severed connection with the company.

I have had occasion recently to review those reports of 1916 to 1919; I went over them very carefully. The first reference in those reports to tests made on Long pistons was in the July 1918 report. The type of piston referred to in this report had a rib across the head in between the wrist pin bosses and extending down one side. The rib was cut off on the other side. On the first test, the piston was installed with the ribless side on the suction side of the motor. The piston had a stiffening ring at the bottom, and it had four vertical and one horizontal slot sawed in the piston. All of the slots at the side of the wrist pin bosses and two of the slots on one side extended from the bottom of the piston up towards the top for a ways. The rib was in between the wrist pin bosses, and the slot was at each side of the wrist pin boss, the ribs like this, two slots went up this way, two this way (indicating). Two of the slots went up and then the other two slots started from underneath the lowest ring, somewhere in that neighborhood, and ex-

tended down for a ways, and at the top of those two slots there was a transverse slot that joined those two slots. That was on the ribless side of the piston.

I could identify drawings of this piston from the records that I examined, and in accordance with my recollection. That drawing was our P-2912; I mean the Franklin drawing. Mr. Clark made that drawing and it was checked by Mr. Roth. That drawing was made under my supervision on July 8, 1918. I would recognize that drawing if I saw it.

(Witness examines drawing.) This is the drawing to which I referred, photostat, Plaintiffs' Exhibit 43. I can't say definitely where the original of that drawing is; it is perhaps in the files of the Franklin Company.

I couldn't tell from my own knowledge, independently of any markings on this drawing, whether or not a drawing of that general character was in those files on or about July 9, 1918.

(Objection by defendants.)

This drawing, Plaintiff's Exhibit 43, P-2912, was in the Franklin Company files from July 9, 1918, if it is still there; that is what we call an experimental drawing. There is no very careful account kept of those drawings after a number of years, say like 10 years or so, they might have been thrown out.

Mr. Bruninga: Object to that as a conclusion of the witness.

I did not make a search for the original from which this photostat P-2912 was taken. I can't say under what circumstances that drawing P-2912 was made; it has been too long ago to remember it.

I know of my own knowledge of another type of piston submitted to the Franklin Company by Mr. Long. We had a piston that we were in production on a great many years and it had a rib across the head in line with the wrist pin, and two ribs at right angles to the wrist pin bosses, which connected the wrist pin bosses to the side walls, and there was six slots running from the bottom of the piston up to below the lower piston ring, which divided the periphery of the skirt into six pieces, and four of those pieces were supported by the two struts, we called them. I can't tell you of my own knowledge when first I saw a piston of that character, but our records show that in March, 1919.

Mr. Sutherland: I object to what the records show. The records themselves are the best evidence.

Mr. McCoy: The witness has testified he examined the records; they are the factory records produced under his supervision.

(Narrative continued) The records show that in March 1919 a piston of that character was tested by the Franklin Company. I wouldn't attempt to say from my recollection, because it is 15 years ago and my memory isn't so good as that. The record refreshes my recollection as to the date. March 25, 1919 I believe to be the correct date; there is a description of that piston.

So far as I could determine definitely, March 15th there was a report that might have had to do with that same piston.

Q. What was the character of that report?

Mr. Bruninga: I object to that unless the report is produced.

Mr. McCoy: I think we have it here.

A. It speaks about a test made in the laboratory on the pistons, .002" clearance.

(Narrative continued) The results of that test were that it had a tendency to set up and they thought it was a little stiffer on account of the baffle plates not allowing quite enough oil to go down the piston and the cylinder walls.

Mr. Bruninga: I object to what was thought.

(Narrative continued) In 1923 I went over the records, looking up the records of when the first Long pistons were brought in. I have made other investigations since 1923; I should say twice besides that at least. All of these investigations, as to the first time that I found mention of a Long type piston of the two vertical webs connected with the skirt wall that is separated by six vertical slots, agree; I found the same results each time. The date of that was March, 1919.

I also made some investigation of those reports to find the first time that E. C. Long or E. C. Long pistons are mentioned in the reports, and found that it was July 1918. I had previously made investigations to locate that fact.

I am the Stephen R. Castor who testified in interferences 49,569, 49,570 and 49,571.

I recognize Plaintiffs' Exhibits 42-A, B, and C. They are the experimental and mechanical laboratory reports for the Franklin Company. Frank Chadwick, the head stenographer, had charge of the files for these reports Exhibits 42-A, B and C, at the time I was working with the Franklin Company, on October 5 of 1918 and July 20, 1918. They worked for me, except when I wasn't there. I left the employ of the company in October 1918.

Mr. McCoy: Direct examination closed.

Cross Examination by Mr. Bruninga.

I testified in an interference in which Mr. Richey and Mr. McCoy were both counsel for the same side that called me. I said in that case that I had also made searches of these records of the Franklin Company. I said at that time that the first record that I was able to find was dated October 5, 1918. I have now made another search and found a set of reports, Exhibit 42-B, dated July 20, 1918. (Witness examines exhibit.) The reason I didn't find the report of July 20, 1918, is because the piston was identified by a pencil note on it, and it was easily overlooked. You see it is marked with a pencil, it says "Equipped with Long patent piston." That was overlooked. In the other reports it is in the typewritten. I don't know if that pencil notation was on there in 1926 when I looked over these records—I think it was. Mr. Louis Stellman put it on, it is in his handwriting. It being in pencil led me to overlook it. I just looked for reports that had Long's name on them. I looked the reports over very carefully this time to see if there was any description we could identify as Long's. I didn't look so carefully in 1926. I doubt if a still more careful search would uncover something earlier. I would say I have all the reports of tests of Long pistons before this Court.

I went over 1918 twice just recently, and 1917 very carefully, and no record was found marked "Long" of that I could identify as Long.

I left the Franklin Company in October 1918. I don't remember the exact date. I couldn't say whether the first or the last. It might have been that the October 5, 1918 report was not under my direction. That is true of the May 3rd, 1919, report.

I have a business of my own now, that is, I am selling insurance. I have been away from the Franklin Company since August 1st, 1931. I started at the Franklin Company again in May 1920. I can't say whether it was before or after the date of May 3, 1919, Exhibit 42-C.

It is probably correct that the only report filed under my supervision is the one of July 20, 1918, 42-B.

I met Mr. Long many times. I can't tell you when I first met him. I don't think I met him first on April 1st, 1916.

Q. You saw that six-slotted, across-rib piston along the order of Exhibit F in 1916 or '17, didn't you? A. It is so long ago I can't remember.

Q. Well, you wouldn't say you didn't see it as early as 1917?

Mr. Richey: Object. He said he didn't remember.

Mr. Bruninga: Don't object because I am cross examining this witness on a point, you simply object and don't state what he remembers and what he don't.

Q. You wouldn't say you didn't see that as early as 1917, a piston of that type, would you now? A. There is no record of having one around the place as early as that.

Q. Didn't you tell Venner about a year ago you thought you did? A. No.

(Narrative continued) I haven't seen Venner in seven or eight years. Yes, I know William Venner, the fellow with the St. Louis dealer. I don't remember seeing him recently. I don't remember seeing Venner for a long time.

I did not see that particular type piston like shown in Exhibit F before 1918. As I have told you, I should say the first I ever saw it was in 1920 at the Franklin Company. I might have seen it in 1919. Now, what's the use of asking me? I can't remember that I saw that, I am not going by my memory, I am going by records that I have looked over; I am not going by memory at all. That also applies to this drawing, P-2912. I don't remember of Clark making that drawing, except from seeing his name on it; that is how I tell that Clark made it. I probably did see him make this drawing. I don't have any recollection of seeing him make it, but I can swear he made it because his name is on it. I can swear a certain man checked it because his name is on there, and because it is in their handwriting. The handwriting on that exhibit (indicating exhibit) is that of Clark; there is his peculiar marking, which he often signed. Because of the marking on this drawing, is the only way I can tell that it was made at the Franklin plant.

That drawing was made as a record of the piston we was going to test. I know that because it was our usual practice. We would get a sample in, we would take and make a drawing of it, a record of it, and then we would test it.

I know that that drawing, Exhibit 43, P-2912, was made in the Franklin Company. I know that it was made from a piston. I probably saw him make it from the piston. As I told you, that was our practice, we would get a sample in, send it to the drafting room, make a drawing, an experimental drawing and send it down to the experimental room and test it. That is good reasoning. I probably did see that drawing made from a piston.

Q. Can you swear that you did? You can't, now, can you? A. (No response.)

I am so absolutely certain that that drawing was made from a piston, because I have been through that year after year, year after year, you do the same thing over and over again, and you know that is the way it happens. That is the way I reason that this happened. That is my belief.

I don't remember of ever seeing a piston like shown in drawing P-2912, Exhibit 43. The records show that a piston like that was on test at the Franklin Company. I don't know from my own knowledge that it was, but from what the records show.

The first piston that came to Franklin like Exhibit F was in 1919. I first saw it in 1920. I take that from the records where it is very clearly described, drawings of it in the reports. I take all of that from the reports. I did not make the report that the piston is described in.

Q. But it bore a certain date and you took that, you reasoned the report was correct, that the report had that date put on, and then you determine in your own mind that that was the first time you saw that piston at the Franklin Company, isn't that right? A. Yes, we have to go by those reports.

(Narrative continued) I think it was Mr. Edgerton who asked me to make a search of the records in Franklin in 1926, when I testified before; it was someone from Richey & Watts' office, and I made the search of the records. I got paid for doing that work at that time.

I testified in Cleveland at that time. My expenses were paid. They said if I didn't come they would subpoena me; I didn't have any objection either way to

coming; I was neutral. I would rather not come in 1926, but I didn't refuse to come.

Q. In the previous deposition you testified as follows, when the question was asked you by Mr. Richey: "You declined to come here voluntarily to testify until you were threatened by subpoena, and then came to save the trouble and expense of a subpoena, didn't you?" And you answered, "Yes." You didn't understand the significance of that question, did you, from what you previously said? A. Yes, I didn't want to come.

(Narrative continued) I didn't refuse to come; no object in my not coming.

Q. I notice that you were able to call off without ever looking at Exhibit 43 "P-2912, July 8, 1918." You have a good memory, haven't you? A. Pretty good.

(Narrative continued) I have a very good memory for short times; I can't remember 15 years back, though. I might remember the drawing P-3984 from the Franklin records if I saw it. I have seen the orginal of Exhibit BB in the Franklin records. The draftsman's name was Sometimer. I knew him. (After examining drawing.) I can't make out who checked it, he didn't write very strong. Yes, I have seen that drawing. I brought that drawing with me; I didn't turn it over to Mr. Richey or Mr. McCoy; I have it here in my brief case. (Witness produces blueprint called for.) I should say that this blueprint that I have just produced was made from the same tracing as Exhibit BB.

Mr. Bruninga: Well, in order that we may be sure about it, I will offer this blueprint produced by you as Defendants' Exhibit BB-1.

Mr. Richey: I object to it as duplicating the record.

Mr. Bruninga: Well, if you agree it is a duplicate I will leave it out.

Mr. Richey: He said it was. I will agree to it if the witness says so.

(Narrative continued) They are duplicates, I should say.

I have some blueprints of other types of pistons submitted by Mr. Long. (Witness produces blueprints.) This one isn't very good because the date doesn't show. This date was 1920, something like that. Those aren't submitted by Long, you understand, they were made in the Franklin plant.

1/16/20, of course that isn't very good evidence because it has been marked with a pencil. That looks as though it had a steel skirt on it, or cast iron skirt, probably not a Long piston; that is a different type of piston. That is not a Long. It has got a cast iron skirt. I thought that was a Long but it is not.

That is the only Long type piston drawing I brought along, only our regular production drawing which is similar to the one you have.

I haven't got a thing back of July, 1918, that I found relating to Long pistons, or that, as they are read over carefully, might relate to Long pistons. If I had, I would give it to you. I am neutral, I don't care. If Mr. Long has it coming to him, I hope he gets it; that is where I stand on it. I tried to bring in the truth of the records as we found it there. I haven't a thing that would help your case at all, or anything that would hurt it. I haven't anything to help the case because I don't know as it can be helped. As far as I am concerned, you see, I don't know all the situation. There might be lots of angles I don't know about outside of the Franklin Company. I wouldn't say that you are going to lose the case, I don't know. You may have lots of evidence somewhere else than mine.

I have no drawings or sketches that I found in the Franklin Company that go back of the year 1920, except the 1919 records which have been produced.

Referring to Exhibit BB-1, that piston not put into production. I know that. This is a drawing of the piston. When Mr. Long brought the piston there, undoubtedly that was the drawing that was made, and I get that from the record, the same practice we had before. That was the practice over there, and I know from previous practice that was ordinarily followed.

I hope my expenses are being paid here. I haven't investigated these records and come here and stayed around Cleveland for nothing. I expect to be paid.

Mr. Bruninga: That is all.

Re-Direct Examination by Mr. McCoy.

I don't know whether or not Mr. Stellman has recently been over the records of the Franklin Company. To my knowledge, Mr. Stellman has not been over these experimental and mechanical laboratory reports within the last two years or three years.

Mr. Edgerton put the small metal clips on the side of these papers. I saw him put them there, he and I were looking them over. They were not on there before we looked them over. The facts that I have testified to are from my best knowledge and recollection of the facts as to the dates I have testified to.

Mr. Bruninga: I want to tell the witness "knowledge" means what you know, not what you figure out. Let him answer the question now.

(Narrative continued) It is necessary to figure it out, as I say, you have been through it for years and years.

I had been over these records before Mr. Edgerton went over them with me, not as carefully as I did this time, but pretty good.

Mr. McCoy: Re-direct examination closed.

Re-Cross Examination by Mr. Bruninga.

Franklin used the Long piston up to the series 12, which was about, say 1929, from 1920 to 1929; about eight years. I don't know how many cars they were used in, I haven't any record but there was quite a good many cars made during that time. As to our average production, some years we made 10,000, some years they only made six, may be eight; eight would be a fair estimate. For about eight years those pistons were used. On an average of 8,000 a year, that would possibly make 64,000 cars the Long pistons were used in, and with six cylinders to a car. That would be over 350,000 Long pistons. We discontinued using them because in the 135 we went to the 3½" bore, high compression, and the Long pistons wouldn't stand up; we got beyond the limit of the Long piston; scored on the strut. Then we changed over to the Invar Strut. That was about 1929.

Re-Direct Examination by Mr. McCoy.

The clearance we used with the Invar Strut was about three thousandths, two and a half, I think two and a half we ran them for a while, two and a half to three thousandths. At the time we changed from the Long type to the Strut type, steel strut type piston, we were fitting the Long pistons about five thousandths.

Re-Cross Examination by Mr. Bruninga.

And the sole reason we changed over to the Strut type piston was because it was better than the Long type. Patent litigation had nothing to do with it, at all.

Mr. Bruninga: That is all.

(Adjournment to following day.)

(9:30 A. M., Saturday, February 4th, 1933, the hearing was resumed.)

Mr. Bruninga: I have here a photostat of a letter of Anna Landon Duke, dated October 17, 1932, and reading as follows: "Iowa City, October 17, 1932. Mr. J. H. Bruninga, St. Louis, Mo. Dear Sir: I have carefully gone over the sheets of records which you sent me and have placed my initials 'A. L. D.' on the back of the ones that I recognize as work done by me at the W. K. Weems place. Trusting that this will give you the needed help, I am, yours very truly, Mrs. Anna Landon Duke." The initialed photostats of V-1 to V-7 of the pertinent pages from those books have been offered in evidence in lieu of the original books, and I understand counsel is willing to agree that if Mrs. Anna Landon Duke were called as a witness, she would testify as noted above.

Mr. McCoy: That is correct, your Honor. I don't think it is necessary to introduce it in evidence.

Mr. Bruninga: I will offer the photostat as 5-J.

Now, instead of the answer in the Simmons case, I would like to introduce in evidence, as soon as I have it available, a copy of the record before the Court of Appeals in that case in Equity No. 3510. I believe that will be for the convenience of this Court, and this Court has considered the matter anyway, in connection with the question of whether plaintiffs can introduce evidence as to the connection of Sterling Products Company with this case. I expect to obtain another copy of that record in the next few days, and I will introduce that in evidence now under the same designation 5-I.

Mr. McCoy: You had some witnesses, the names of whom you were to give us.

Mr. Bruninga: With reference to Mr. Schoengarth at Ironwood, Michigan, I am going to make every effort to get Mr. Schoengarth and one or two

supporting witnesses down here. I understand there is a man by the name of Garner, the other one I don't know as yet. I am going to try my best to have them down here instead of having counsel go up to Ironwood.

Mr. McCoy: We would like to have the reservation that the deposition be taken at such time as Mr. Richey may be able to attend.

Mr. Bruninga: Of course I will do that.

The Master: Yes, certainly.

(Counsel for defendants agreed to furnish counsel for plaintiffs addresses of witnesses to be called.)

(At this point testimony of Gulick, Record pages 699 to 704, was taken.)

JOHN L. BURNS, a witness called in rebuttal by Plaintiffs, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. Richey.

My name is John L. Burns. I live at 225 Reed Avenue, Syracuse, New York. I am employed by the Franklin Company, The H. H. Franklin Company of Syracuse, New York. I have been employed by them for 28 years anyway.

My first job for them was as a tire man; the next job was a roadman out for service, until 1907. From 1907 until 1910 I was a sales department territory man. The year of 1911 I was superintendent of the New York branch of the Franklin Automobile Company, a selling organization of the H. H. Franklin Manufacturing Company; and in 1911 wound up my work there and I became a member of the engineering staff, engineering department at the plant in the capacity of chief inspector, chief tester in the testing of cars. I served in that capacity until January of 1918 when I became a member of the experimental division of the engineering department. From 1915 up until 1918 my job primarily was to improve the car, that was the work that I was supposed to take up, as I went into the experimental room from the testing division, and that work was to—well, anything that gave grief on the road, or anything that was hard in manufacturing, my job was to find improvements to make the car a better car. That continued up to now.

The nature of the trouble with respect to pistons from 1915 up until 1920 was noises, set ups, slaps, piston slaps and piston scoring. By "set-ups" I mean when the clearance is insufficient or the design of the piston does not allow the walls of the piston to yield and give and make a smooth operating job, instead of that there is something there that is rigid, we didn't know what was going on for a long time, and the alloy of the metal would pick up on the cylinder wall, and then it would build up, set up, that was due to trying to make the piston a quieter job in some cases, in other words, it slapped with the tolerances that were required to make it not score.

When this "set-up" occurred, metal from the aluminum piston would deposit on the cast iron cylinder wall. When it did that, you just stopped and pulled your motor down, and put in new pistons, as a rule.

Up from the series 9-A, the 1916 model, up to 1919, we were using an ordinary aluminum piston with a rib on the inside of the skirt, and there was all kinds of modifications of the original. The original was just a plain skirt piston with oil ways running in some cases in the form of a thread, in some cases just cylindrical rings attached around it; that was the standard piston then. Then they got into slotting, then they came in to put in expanding rings on the bottom of them; oh, there was various things to try to make the job satisfactory. Nothing ever was done, though, to make the job satisfactory from that original type of piston.

Comparing Exhibit B piston with the type pistons I am speaking of, that is the original piston that we speak of in the 9-A, and that is the one I spoke of as the original piston that had given us so much trouble. The expander ring wasn't the answer, it wasn't consistent, you could put an expanding ring in the first time and the results you got just prompted you to go further with it, and the final analysis was it wasn't satisfactory; it caused dragging and power losses so tremendous that in some cases was due to the un-uniform wall tension of this spring that was slid in. The piston we put the ring in apparently would be better than the original piston without a ring, but there wasn't any of them that was a satisfactory piston. It compared in structure with the Exhibit B practically the same as that except they would turn a little bit of a way inside there and snap this ring in it; it would be a regular piston, only we would take that out of cars and have a little bit of a recess made in

there to hold the ring in position; they would be the same piston, you understand.

Q. Will you state whether or not you yourself were working on this problem of trying to cure these troubles? A. My gosh, everybody was working on them. My job was inspector of the testing shed, I turned down the cars for the engine being noisy, and the experimental department, which was another division in the plant, would come over and try to give us a little help with the grief we were having, and make various suggestions, and bring over different things for us to put on.

(Narrative continued) Besides the schemes I have named, that were used to try to rectify these troubles, we used to put an expanding jack inside of them, and throwed them aside, discarded them; and the fit of the wrist pin was changed from time to time, feeling, well, I suppose if we put a little drag on the wrist pin fit, the clearance, it would change the picture a little bit. It was just one continuous thing to another; every week somebody had a suggestion and we would follow it through. And to make the aluminum piston stay in the Franklin engine, that was the whole thing, because it had some features—light weight over the cast iron; it was a nice piston to think about.

Other schemes we used were: the expanding rings, and the slots, and things like that. That would cover it. In other words, take a piston like that, and give it another thousandth or thousandth and a half, or two thousandths, or right in that area through there, which seems to be the bug-a-boo of the set up. For an inch below the bottom ring, we would relieve it; between the top of the boss holes and the bottom ring we would change the area there.

As to other types of pistons tried by us besides this Exhibit B with the ring, up to January, 1918—now, my job was on that original piston, and its various modifications; up to January of 1918 it was always with this original piston in various slots and expanders and jacks and clearances, and all that stuff, but after January, 1918, I became a member of the experimental division, that department was the department that was trying all the different samples submitted of various makes and alloys and those things, and iron and cast iron pistons, with compromises—the Wainright cast iron, and the slipper type, and Dahl metal, they used to designate it,

and Zephyrs, and all the other pistons that was coming, that was coming up, they all had to be tested. I made some of the tests on these pistons. If I didn't supervise the installation in the car or in an engine in the car, why I probably drove the car on the road, because that was one of my jobs, was taking something that would make the car a better car, that was my job to improve the car.

In January 1919 there came to my attention a piston of Mr. Elmer C. Long. I made an installation in a car owned by the company but driven by Mr. Murphy, our chief engineer, of a set of pistons that was handed to me as Long pistons.

Describing that piston, it was a lot like this one (indicating Exhibit B) except it had a T-slot in it, that is this vertical slot ran into a slot that was around this way, and on the inside it had what they call lbs, on the inside of the skirt. That is my first recollection, you might say, with the Long piston, as I knew it.

Mr. Bruninga: Have him describe that piston a little more fully, Mr. Richey.

That is the way I remember the piston, the slots in it carried up through, because our slotted pistons had those slots like this (indicating Exhibit B). This Long piston was carried square, running into the other slot.

Q. Now, what if anything have you to say regarding whether or not there was a U-slot in that piston, if you remember?

Mr. Bruninga: Objected to as leading. The witness has said there was a T-slot in it.

(Narrative continued) There was several slots, but the difference between that slot and our slotting was that the vertical slot ran up into another one, where ours stopped in the middle of the skirt, approximately.

Comparing the drawing, Exhibit 43, with the piston which I installed in the car in January, 1919, this is the type piston that I speak of. By "type" I mean this slotting and all this ribbing and the general appearance of it. The Exhibit 43 piston is the piston I installed. I installed a set of six in the car, six-cylinder car. The first time I ever saw one of these pistons like shown in Exhibit 43, was January, 1919. The car was driven by Mr. Murphy, he was driving, he always drove a car previous to the announcement of a model. In other words they would build a car and Mr. Murphy would get it to try out the

different things for a period of six or eight months previous to the announcement of that model. In other words, he tried out the preliminary car.

The pistons installed in that car were noisy, it wasn't wholly due to the design of the piston, the cylinders were worn. I operated the car with the pistons in it, in the engine. When I saw them they were noisy, had slaps. The clearance was supposed to be 3-5 because the cylinder was supposed to be gauged, in other words, the piston should have been 3.245, 3.247, but the cylinder was worn two and three thousandths, some of them, so that it had more than the clearance that it was supposed to have, but the particular cylinders had something else in them, they wanted to continue testing, that is why they were left on with this type.

There also came under my observation a piston of Mr. Long's different from the one I have been talking about here in Exhibit 43. In the middle of March, 1919, Mr. Long came to the factory, because he walked into my department with Mr. Stellman, and Mr. Stellman introduced him to me, and he had—well, they had a set of pistons, I don't know whether Mr. Long had brought them, but it was a set of pistons they had with them and Mr. Stellman told me to get a car, sales department demonstrator, and get the cylinders and pistons off it immediately, they had a set of new Long pistons they wanted to put in this car and were anxious to get away before the day was over, wanted to leave on a trip. And it was a set of pistons that was different than the set of pistons I put in Mr. Murphy's car.

The piston shown in Exhibit 43, that we put in Mr. Murphy's car didn't have any designation, as I remember it, at all.

The piston that was brought to me in March, 1919 was my first acquaintance with the piston that we later knew as a Long piston. That is, it had a strut going, surrounding the wrist pin boss, carrying over to the skirt, and it was a straight ground piston; anything before that was always taper ground, any piston regardless, and that was the first contact I had with a straight ground piston. That is about all I remember about it; of course, it had slots carried on through. There must have been six slots, one in the middle, on each side, and up through the side with the wrist pin there were slots. There wasn't any skirt webs running vertically, there was webs in the head, and there was what—if you call them webs—there were two struts carried over

around the wrist pin boss, and over to the skirt. There was horizontal slots in it, the head was separated from the skirt, except the ribs that carried from the head down to the wrist pin boss.

Comparing the drawings of the Long patent 1,872,772 with the piston that I saw in March, 1919, this is the piston here.

After Mr. Stellman and Mr. Long brought me those pistons, we installed them in a demonstrator, that was a car, it was a practically new car, had approximately 1200 miles on it; in other words, it was well broken in, and we removed the pistons and cylinders that was on it and made an installation of new cylinders and pistons. I supervised the work, that was my job; I had mechanics there working on it. I was given the assignment by Mr. Stellman to get that job through.

Besides the mechanics and myself, Mr. Long was there all day. Mr. Long didn't have anything to say about these pistons; he just relied on my work to see it was done, there wasn't nothing to do in the line of fitting, it was simply a case of taking off the cylinders and the yokes and the pistons and making a proper installation of the new pistons, and dropping the cylinders on and coupling up the affair—well, it was in the middle of the morning when they came in and they went out in the late afternoon, so you see there couldn't have been an awful lot of fitting of any description; simply a case of putting on what he brought.

I remember Mr. Long saying he had something there that wouldn't set up. He said, "I have a piston here that won't set up." That is the remark he made.

The pistons in the car in which we installed this Long piston like the one shown in the patent, were Long pistons with a T-slot. That had been put in in the plant, that had been put in the car in the engine assembly, and my job was to get that car that was operating with those pistons and bring it down in the experimental room and remove them and put on the new pistons Mr. Long had. The pistons in the car before we put in the new pistons were like Exhibit 43. The clearance given the pistons like shown in the patent was .002" straight ground. That piston was known at that time as "Special Longs." The piston that we put in that is like in this patent that you are talking about was known as "B." Later on the piston shown in the drawing Exhibit 43 was called "A."

I know nothing further about the history of the type A Long piston.

The type B piston, from that installation there, was worked on practically 100 per cent until the time it was installed in production. It was probably installed in production in the fall or winter of 1919, and it continued in production until 1928.

There were records kept of the tests in the laboratory and in the engineering department between 1915 and 1920. Of course, from January, 1918, I wrote a report weekly of the activities of the floor or of the car end of the experimental department, and that was incorporated in a whole report of the entire engineering department, laboratory, mechanical department, and laboratory tests, the body division, and one other, and they were all incorporated in one report. In other words, my report and somebody else's report from the mechanical lab and the chemist, he put in one, and the body division put one in, and that was all incorporated in one report, and then a copy of the whole report was sent back to the experimental department, and I would check over from week to week just what the whole report was, because there was something that was carried on in the other departments, so that an engineer, if he was smart, he would look the whole report over. Every week a copy would come back to me containing my report with the others.

In connection with the physical work of writing up these reports, I wrote the car end of the division; that is, if there was anything done on a car, any improvement made, or any dismantling or any additions made to the experimental cars, that included mileage cars, Mr. Williams' car, Mr. Murphy's car. My job also was to keep Mr. Franklin's car in first-class running order; anything that was done was reported on because we used to use these cars for various experiments, and naturally I would write them up at the end of the week what was done, to keep everything before the engineer. These records were the official records of the engineering department of the Franklin Company. They were always relied upon by the engineers as such.

(Short recess taken.)

These reports speak of vendors of various things coming to the plant, with certain pieces. Now, supposing there was a piston pin brought there by a vendor, a manufacturer, a representative of the engineering department, they met them and if they had something of merit, he would tell them to send in something for us to

test. The report contains those notations in there. Now, anything that was actually tested is in the report, in the weekly report.

The reports in front of me on the chair are reports from the various divisions of the engineering department, written weekly and sent upstairs into the engineering office, and the chief engineer would digest, he took those various reports and would make them into that report as you see it. These are the records we have been talking about. This is from 1916 to 1919, inclusive. These are all of the records for those years; those are the reports every week. I have gone through every one of them.

The first record of anything with the name "Long piston" in this bunch of reports, is July, 1918. It refers to a test conducted in the laboratory. That would be the first one I would recognize as a Long piston, was in July, 1918. I don't know what that piston was, but it mentioned that it had ribs on it, on the inside of it. I would say it was the type A piston. I base that statement from the fact that the type B, with the rib on it from the wrist pin boss, was the first time that I knew the Long piston in its present form. That is, the July piston was different from the Long piston as we knew it later on. I have examined this item of July, 1918, to which I refer. In making this test they spoke of where the rib was. Now, the Long piston with a strut in it did not have any rib in it, and in the report it talked about when they tested a Long piston where there was an interference and the cap screw striking the rib. Now, in the Long piston of type B there is no rib that that wrist pin holding bolt could strike. The type A piston had it.

There is nothing else in that report of July, 1918, that enables me to say whether or not it was the type A or type B piston, than the things I have already named.

Can I use the little note that I made out of that report? I have some notes here in my pocket I haven't used, but I made some notes where the references came to Long pistons to enable me to give my testimony correctly. I looked over these reports yesterday. I did not look over them prior to that. I looked through them to be able to talk honestly. I was looking for the place in that report where I first installed a strut type Long piston, and it was the time that Mr. Long came to the plant in March of 1919, but I wanted to get that date

accurately, because it could have been January or it could have been February, but I wanted to be sure it was March. Now, I wouldn't say up to yesterday that it was actually March, but I knew it was in 1919, because it was in the spring of the year and it was hard going when I made that installation.

I looked through the reports from 1916 on. The purpose of looking through the reports from 1916 on was to get the starting point of the Long piston coming to the plant. I made notes from those records there.

Referring to my notes, the first notation on Long piston was July 20, 1918, saying no rib on the suction side; next October 5, 1918 it mentions the Long patent. It says one rib on the exhaust side. In other words, those two pistons are the same. It designated them with no rib on the suction side, which means a rib on the exhaust side; and with one rib on the exhaust side, which would really mean no rib on the suction side. That was October, 1918, in laboratory work.

The next reference to Long's piston was in January 1919, January 18, Mr. Murphy's car, the first mention of a Long piston being installed in an automobile, car engine. That refers to the installation I made.

The next reference I find is on March 8, 1919, in Mr. John Wilkinson's car, new car. The report says that that was a "one rib Long" piston. That would be type A. March 15, 1919, sales department demonstrator. It says here: "Removed Long patented piston .003" to .005" clearance, and installed special Long pistons with .003" clearance, and three wrist pins." That was type B. After that I found references to the type B piston. On March 22, 1919 was the first mention made of Long piston with sides supported by ribs to wrist pin bosses.

Referring to Exhibit 42-A, B, and C, those are parts of the record which I have described as being the records of the Franklin Engineering department which I looked over yesterday.

Mr. Richey: Now, we offer for the inspection of the other side all of these records. We see no need of offering them all in evidence. They are original records of the Franklin Company, and of course they don't want to let them go.

The Master: Of course they want a little time to examine them.

Mr. Bruninga: I will go ahead with the cross examination of the witness. I don't know whether I want to see them or not.

(Narrative continued) I did not make an inspection of those records at the Franklin plant within the last week or two; I inspected them over at the office of Richey & Watts. Mr. Edgerton and the gentleman in the library, Mr. Snyder, was there at the time. There was various ones coming in and out there all during that time. Mr. Castor was not there, Mr. Murphy was not there.

Mr. Richey: All right. You may cross examine.

Cross Examination by Mr. Bruninga.

I believe I testified for Long in an interference proceeding in 1926, down in Bodell's office.

Q. You were asked this question at that time: "What year was it, then, that you first worked in the experimental room?" and you answered: "1917"? A. Yes, but I didn't go into the experimental actually until January, 1918; that is, as a part of that division.

(Narrative continued) It is a fact that I worked in the experimental room in 1917. I was in and out of there all the time.

Q. You were also asked this question: "Then is it possible that both Mr. Marks and Mr. Stellman experimented on pistons prior to 1918?" and you answered: "Yes, sir"? A. I suppose I testified that way.

(Narrative continued) I don't recall what I said in that thing; you would have to tell it to me. It is possible that Mr. Stellman might have experimented on pistons prior to 1918 without my knowing about it. For all I know, he might have been experimenting on Long pistons prior to 1918. I haven't found any records of 1916 on that, our record doesn't show anything in 1916, and it doesn't show anything until 1918.

I saw and went over those records at Richey & Watts' office yesterday. They are Franklin Company records. I did not bring them over; I don't know how they came over. I didn't search the records at the Franklin plant. What I am testifying now is what I found in those records before the Court which I found in Richey & Watts' office. I feel that that is the engineering record of all those weeks, week and week. I know they are. I know that is a complete record of the complete report of the engineering department. There might have been somebody take a sheet out, I didn't count; there is no numbers on them; but it is pretty complete. It is all connected up.

It is possible that there are other records at the Franklin plant. It is possible, but not probable, that there were other records in 1916 and '17 and '18 and '19 at the Franklin plant that I do not have in that file. I feel that the report is a complete weekly report. Now, if there is anything taken out of there, it wouldn't be connected the way it is. I went over them sheet after sheet yesterday. I didn't have anything to do with that report until yesterday, in Cleveland, and I went through it to be honest in my testimony; that is the idea.

I first met Mr. Long in 1919, and I was introduced to him by Mr. Stellman.

Q. In 1927 you testified as follows, in the Long interference: "Do you know Elmer C. Long?" answer: "Yes, sir." "Q. How long have you known him?" "A. About nine years. Q. That would bring it back to 1918, isn't that right? A. Yes." A. Well, I said about nine years. Understand when I gave my testimony down there with Mr. Long, I gave it just as honest as I knew I could give it, and I didn't have any records to go from other than memory.

Q. Now, when you said that is the type piston, and pointing to Exhibit 43, which Mr. Richey handed you, which you said you had installed in Mr. Murphy's car in January, 1919, you just merely glanced at that print, didn't you? A. No; I looked at the print and see the design of it. I saw that it was a—it didn't have struts in it.

Q. And you also knew the number P-2912, didn't you? A. No, no, I didn't pay any attention to the number; I was looking at the piston.

Q. But before that you said that that particular piston had a T-slot? A. Yes.

(Narrative continued) By T-slot I mean they slotted that piston from there (indicating) and ran it into a slot going around here; that is what I would call a T-slot. In other words, I mean a slot just about like shown on Exhibit 3-O, except it is carried all the way through. It had a slot below the bottom ring land, and then another slot extending from the center down to the end of the skirt so as to make a T. That is the kind of piston I installed in Mr. Murphy's car in January. It had webs on the inside here, running from the top of the skirt, the top of the head down along the side of the skirt and opposite this T-slot. That is what I call the type A.

Exhibit 43 shows the T-slot right here; here is a slot on the skirt, isn't it, that red mark "R." That is the way I construe that drawing.

Q. As a matter of fact, that slot on that Long piston which you installed in Mr. Murphy's car was like Fig. 2 of patent 1,395,441? A. That is the slot there; that is the general type of the piston, slotted up and running into a horizontal slot.

(Narrative continued) I don't recall whether or not it had a slot like shown in Fig. 1. I recall this part of it, because we had done our slotting there ourselves; this was different; there wasn't much in the outside appearance of the piston over what we were using except for the T-slot. The T-slot is what struck my eye. That is the one that was later referred to as type A. At that time there wasn't any type A and type B. Later on I feel that that was the type A, and the rib type of the wrist pin boss was type B.

The pistons installed in Mr. Wilkinson's car in March, 1919, were practically the same as those installed in Mr. Murphy's car in January, 1919. The piston that was brought over by Mr. Long and put in later on in that test that you said was in March, 1919, that is just about the piston as shown in Exhibit F; that is practically the piston; I don't say this was on it, but it is practically this piston, that it had the supporting bosses.

When I say "this was on it" I mean that seems as though it was later on; I wouldn't say it was or wasn't on there, but I know from the first time Mr. Long brought the piston, this piston, we were doing a lot of things to make that successful in production. I wouldn't say that relief was on there or wasn't on there. I wouldn't say that it was the practice to put reliefs on pistons; this piston here didn't have any relief on it (indicating Exhibit 3-O), or this piston didn't have any relief on it (indicating Exhibit B).

As to reliefs on pistons, you had to have some place to expand it, for it to go into, and there was a hugging action going on, if you didn't grind it elliptical, you had to put a relief in there. In other words, you could avoid putting an actual relief by grinding it elliptical. That was done by grinding it elliptical with the short axis of the ellipse on the line of the wrist pin boss; that was done later on in our own plant. That was done before Mr. Long brought the pistons, Exhibit F, there. We had oval pistons in the factory. Now, that was—no, that was

later on, there wasn't any relief on pistons before—there wasn't any relief on pistons before 1919 to my knowledge, not even on pistons like Exhibit B. It was the practice to do that in cast iron pistons. I am speaking of the aluminum pistons. That was done a long time before in cast iron pistons, although we had hundreds of cast iron pistons that did not have the relief on them. I wouldn't say that we did that as early as 1915. I wouldn't answer that question. I know we made a model, in the 20's; it was actually an oval piston, with the short axis along the line of the wrist pin bosses.

(Adjournment taken to 1:30 P. M.)

(1:30 P. M., the hearing was resumed.)

Referring to that Long piston that we installed in Mr. Murphy's car in January, 1919, I don't know whether that was relieved in the region of the wrist pin bosses on the outside. I don't know anything about the relief on the pistons mentioned in the reports of July and October, 1918. I know about the pistons, but the relief part of it, I wouldn't pass a remark about it, whether it had it or didn't have it.

I said that it was my job to make a better car. I was under Stellman. Stellman appointed me to that job. Stellman was chief engineer. Mr. Murphy was chief engineer when I was appointed in January, 1918. Before, Mr. Stellman was assistant chief engineer, and I was directly under Mr. Stellman. I reported to Mr. Stellman.

This Exhibit B type of piston was used in the Franklin car engine in 1919, in January, in Mr. Murphy's car. No, I am wrong. This is the aluminum piston that was incorporated in our 9-A, 1916 automobile, the 9-A 1916 model (indicating Exhibit B). It was used for 1916, 1917, 1918 and part of 1919.

I said that the top of the skirt was the area of grief in all pistons. In fact, in all pistons the greatest amount of heat comes from the head, and carries right into that spot, and it is the most rigid part of it because it is directly under a solid head and the wrist pin bosses, naturally, there is just less chance of the piston yielding in that section, that is the point we have to give the greatest clearance. What you want there, you want a piston to grow as it gets warm to fill up the whole interior, to eliminate slap. You see there are two things in the piston to be successful, one of them it must be quiet, the other one it must not score. Now, you give it the greatest possible clearance you can so it won't score; in the

other sense you give it the least amount of clearance you possibly can so it won't slap. I think that slot in Exhibit 3-O should be carried down to the end, to allow the piston when it expands, takes up the heat, to expand and pick up so you don't have a high pressure area for wear; you should have a small pressure area for wear. In an ordinary trunk piston that has no slotting in it at all, if you put it in a cylinder it begins to expand from the top down, tries to cone out with the big diameter at the top and the small diameter at the bottom, so the important place to have the yield is really at the top of the skirt, gradually tapering down. That is what I meant by the area of grief at the top.

I first saw Exhibit 43 piston today. If that was over in the office, I wouldn't say that I saw it yesterday. I tell you honestly I was tied up with that all day. I won't say I saw it yesterday, I saw it this morning.

A. Was that the one over in the office (addressing Mr. Richey)?

Mr. Richey: No.

Well, I saw a blueprint of that type of piston over in the office, that is down here—that is the first time I saw that.

Q. Do you know where that blueprint is?

Mr. Richey: We have it over in the office, yes.

Mr. Bruninga: What is it, the exact thing?

Mr. Richey: I was told it was the exact thing.

Mr. Bruninga: I would be glad to have it. One of my objections was that it was so faint at the top of the rectangle we couldn't tell what was written on there. I would like to have you send for it.

(Thereupon, Mr. Richey sends for said blueprint.)

(Narrative continued) I believe I said that the Long piston that we used later on came to be known as type B, and that is correct.

Q. And that is the one, Exhibit F?

Mr. Richey: I object to that. He didn't say it was like Exhibit F. He said it was like one in the patent.

Q. Was it or was it not like Exhibit F, that type B? A. Well, it was a strut type piston."

(Narrative continued) I don't know as it was any different from that piston Exhibit F. As far as I can

tell it was the same thing. I said that was called a "special Long." They called them "special Long patented." They used to say "Long patent piston," and this was designated as a "special Long patent piston." I believe the one we installed in Mr. Murphy's car was later on known as type A. That had the T-slot on one side and the ribs going up the skirt on the other side. That rib interfered with a bolt that held the wrist pin solid to the connecting rod, the clamping bolt of the connecting rod that held the wrist pin rigid. In other words, referring for instance to Exhibit 14, that piston had a rib going down from the head along the skirt, and interfered with the bolt on the connecting rod. That was one of the things that was the trouble with it. Now, they didn't all do that when they were installed, but evidently it was just close enough to that in making its cycle sometimes it would possibly wear, a lot of things—evidently clearance was so little that at the beginning they probably would n't strike but as the mileage was built up in some of the yielding portions, and it gave, it allowed it to come close enough to hit that. Sure, we filed them, got a cold chisel and cleared them out, gave them clearance. That worked all right, as long as they had clearance. The interference was a plain mechanical matter. There was nothing the matter with the piston otherwise, that would be just a matter of the details not looked into closely when they made the drawings so that the casting had greater clearance at that particular point. There was just one rib down there about at a plane at right angles to the wrist pin boss. That piston wasn't a good piston because it wasn't a quiet piston, and it set up. It wasn't as good as the one known as B. I know of no reason why it was better than A; evidently it had greater yielding possibilities, that is all the piston done. The B piston was the nearest thing to being a satisfactory piston we have used.

The type B piston was discontinued in 1928 because it didn't perform as satisfactory as a piston that was introduced by a competing company, known as the Invar Strut piston. The Invar Strut just beat the Long out on the pistons from the results obtained in the laboratory and in the car, gave a more all around satisfactory piston. The weight is slightly, possibly a little bit more than the Long, but it wasn't a factor. We thought more of an all around satisfactory piston than we did on any ounces, it would be a small number of ounces or fraction of ounces that would be the difference in the weight.

In 1928 when that Strut type piston was adopted, the power of the engine was increased somewhat; they made a bigger motor. That motor was for the 1929 model, and tested in 1928. The service of a piston was comparable to everything else that was in that engine, more subject to grief on the road, bearings and everything, high power engine. It wasn't necessarily a higher speed engine.

We had some trouble in scoring of the Long pistons just about in the plane where the webs run into the skirt, on the thrust side of our engine, or on the exhaust side, as we called it, that is on the thrust side opposite to rotation; that is where the scoring, 99 out of 100 occurs in the pistons, on the thrust side. In the Long piston it usually occurred back of the webs. I don't know what was taking place in the piston. That is something—it always did the maximum scoring, you could see the heaviest portion directly back or the other side of the strut, even when we made the webs as thin as shown, for instance in Exhibit F, it would still score. The scoring was always back of the strut. Exhibit F piston, right there, was approximately the Long piston that we used in 1928, only in another size, greater size.

I wouldn't say what was going on inside of the piston when it scores and don't score because here is the funny part of it; you can have the same piston in another motor and be out and do just as hard work and it won't score in the same relation on the cylinder; or, another matter, it may be number 5 will score and on another motor it will be 2.

What we started to use in 1928 was a piston like Plaintiffs' Exhibit 41; it had a little wider strut, practically the same thing, though. That didn't have any webs in it; there wasn't anything that could push out. The scoring in the Long piston was directly back of the webs. I wouldn't say that would cause the scoring, and I wouldn't limit myself that way.

Going back to Mr. Murphy's car, in which the Long pistons, type A, were put in in January, 1919, the cylinders were badly worn. It wasn't a fair testing of the piston. There was things on the engine or incorporated in those cylinders, possibly a valve guide or maybe the fins were embedded deeper in the iron, or something that evidently they wanted to carry that test on with those cylinders rather than take them off and put on new ones. That would be my assumption or reason the new cylinders weren't put on at the time the pistons were put on.

I won't say anything about the tests in July and October, 1918, with the type A piston, other than what I read in those reports. I have no independent recollection other than what the report says of 1918.

I know we put Long pistons in Mr. Murphy's car because they came to me, as they always did whenever there was any work given to me, that would always be given by the head in that department, you might say Mr. Stellman or Mr. Murphy or somebody would say "John, I want you to put these in so and so's car." There would always be a slip on there, like a working order, maybe it would be written in pencil, just as an ordinary note, and when I completed that job, when that job was done, I supervised the work and took the car out and tested it so that the car would be satisfactory for the officials to drive that, to take with them or to go home with or to use.

Mr. Wilkinson's car had that model A piston put in it on March 8, 1919. That car, I wouldn't say how it performed because as a rule Mr. Wilkinson, he was vice president and he was the big man in the plant, mechanically in the management, as far as the building of the car, and he was the kind of a man that he preferred to drive his own car and break them in; nine times out of ten if I had a job for Mr. Wilkinson, he would get in the seat and drive off, he wasn't a bit fussy if it worked on four cylinders, as long as he could go as fast as he wanted to. He always wanted to go fast. He didn't care anything about an automobile that was nice and quiet and anything, he always wanted speed.

Mr. Richey: We now produce for examination of counsel the blueprint he asked for, which the witness said he saw in our office. (Producing blueprint.)

(Narrative continued) Mr. Wilkinson made no complaint to me about the pistons in that car.

Referring to the sales department demonstrator which we fitted up with Long pistons in the middle of March, 1919, we took out of that car a set of those T-slot, type A, pistons. As to the pistons that Long said "I have pistons here that won't set up," they didn't set up; they were beautiful, when this trip was completed, about 900 or 1000 miles on them, this car was pulled down after I made the installation, and they were all in fine shape.

We didn't start to use Long pistons right after that; there was a lot of work done; that was the beginning of

the testing of the Long piston of the strut type. In other words, there wasn't anything else in the picture then around that experimental department to any great extent except that Long piston, and that gradually worked into production, because it was the first honest, successful tests they ever ran on aluminum pistons on a motor that was good. That Long piston was the first piston that was quiet and would go out and do a real day's work.

Mr. Richey: Which Long piston were you referring to in the last answer?

The Witness: The type which had the struts, like Exhibit F.

(Narrative continued) We started to put those pistons in production after this test, in the fall or winter of 1919; they started machining them up and making molds; we were putting them in official cars, cars belonging to Syracuse people, in other words, we got them in as many car owners' hands as possible, to get the reaction from them the way they sounded and the way they performed; and that gradually led to production. Before that the Service Department took some of them—service, you know, never specifies as being adopted until production actually adopts it; but they were sent out into service for reasons of getting as many as they could into the hands of the owners.

Those pistons went into the service department in the spring of 1919 only as an experiment.

I never had anything to do with Long dealers.

Q. You don't know whether the Long dealers were using them as early as 1918?

Mr. Richey: You mean to ask him about Franklin dealers?

Mr. Bruninga: I mean the Franklin dealers, yes.

A. Yes, we offered those anywheres I was sent. I wouldn't go to the dealer but we always had a number of dealers that we could rely on, in fact they would have in their service organization a Franklin trained mechanic, and I could send things to them. I used to send pistons, valves, spark plugs; if anything acted good in our tests and we wanted to get a reaction from the field I would send them out to the service department I knew would give me a good honest opinion. I sent them to Chicago, Pittsburgh, several areas we could get some

good testing done. I wouldn't say St. Louis, although we had a fairly decent dealer out there. The places we worked in was places where there was hills, because you could drive pistons in a flat country where they wouldn't show up like a hill climbing, long sustained hills would bring out, hill climbing with wide open throttle would bring up the heat and cause grief where fast driving on the level wouldn't do it.

(Narrative continued) I believe William Venner was part of the dealership in St. Louis; I think his job was service manager. I saw him in Syracuse a year ago, probably, maybe a year ago this time. I don't believe he was doing anything.

I didn't know that Venner was using Long pistons in 1918 for replacement in Franklin cars.

I have gone through these reports thoroughly that are before me on the chair. The first mention I claim of Long pistons occurred in July of 1918 in the report, Exhibit 42-B, on the third page. That is the first report where the Long piston enters into the picture.

I came to Cleveland, I got here a quarter to eight yesterday morning, 7:45. I spent the day going over the reports. I discussed this matter yesterday with Mr. Edgerton, who is with Richey & Watts. I got my information and of course I had it in the background, all of this stuff I am telling you today, of meeting Mr. Long and making the installation, but to get the facts up to date I consulted those reports there. I went over this matter that I have been testifying about today with Mr. Edgerton.

I did not bring this blueprint, F-2912, with me. I saw it over in Richey & Watts' office. There is noted on it in red "MD28"—some number on there with an X or something back of 2-8. "MD80-X"; "MD28—is that an 8-280."

"280-X" does not mean a thing to me. On the upper right-hand view also appears some red marks, but I don't know what they are. I don't find them on the photostat. I guess this blueprint belongs to the Franklin Company. I don't know what that mark is below "D. R. Clark."

I notice on the blueprint "6AL58" and right above that symbol there are lines which seem to run up into a little part. I couldn't tell you whether there might be something noted above on the original. That also shows faint the same way on the photostat.

Mr. Bruninga: I just want to identify these matters on the photostat, so that I can return this blueprint to Mr. Richey.

Mr. Richey: Well, we will offer it in evidence if you think it is important.

Mr. Bruninga: Yes, you can offer it in evidence; I would like to have you do so.

Mr. Richey: Well, I offer it in evidence as Plaintiff's Exhibit 46. I do it reluctantly because I am duplicating the record, but on account of the question that has been raised by defendants' counsel.

(Narrative continued) I did not search the records at the Franklin Company before I came here. I was called to come here.

I am not drawing any money from the Franklin Company at the present time. The last time I drew any money was just about election, I had a special assignment on an army job. You see we have Franklin motors in army service, that is cavalry, on armored cars, trucks, commanders' cars. I was with them on the original contract on the reorganization forces and they wanted me to go down there and give them a pep talk to get them interested to buy Franklin motors, but the army isn't buying motors.

I am still an employee of the Franklin Company.

I have no independent recollection of the experimenting that was done with the Long pistons in 1918, nothing but what is in the reports. My first contact with them is supervising work in January, 1918. I don't remember that I operated a car with Long pistons in it in October, 1918.

Q. In that Long interference you testified as follows: "Did you operate or drive a car for test purposes having Long pistons in the motor? A. Yes, sir. Q. In what month was that? A. I would say the same month as I feel that Mr. Long and I first met, October, 1918. Q. How do you fix the date of October, 1918, as being the first time you met Mr. Long? A. I know from the model that we were working on, or series we were working on, and the length of time it was in production. Q. Do you recall what the name of the series was? A. Yes, series 9-B." You testified like that—counsel will tell you—in that case? A. I probably testified. Yes, I said it was around the winter of 1919 and it could have been in October, it may have been in March, of 1919.

(Narrative continued) When I testified there, I will say something maybe you won't like—It was in the winter of 1918 or 1919 when I said what is in there, but it was, you might say, just trying to recollect the events, but actually what I am testifying today is what I got out of them books when it was; it was in the winter time, the winter of 1918-19, that is, it carried over. You get what I mean? Now, I said three months this way in that report, and I am saying about three months this way in this report, 1918-19. In that case I testified about, I didn't have a chance to look at records. Now that I have a chance to look at the records I go by the records absolutely, rather than my recollection.

They promised they would pay my expenses and give me something, give me my salary, for coming here. I am not working, I couldn't afford to do it otherwise.

Mr. Bruninga: That is all.

Re-Direct Examination by Mr. Richey.

When I testified in the interference case I didn't use the records before I testified. Since that time I have consulted the records. I will tell you why, if you want me to say it right in here. I would like to tell you why, because I was always later on the Long piston installation than anybody else, and this saying it from just memory, I made up my mind I wasn't going to do it. The records have absolutely refreshed my recollection and memory.

Q. Now, in your testimony in the interference you said, we asked what year it was that you drove these Long pistons, and you said: "I would say the same month as I feel that Mr. Long and I first met, October, 1918"?

Mr. Bruninga: I don't think it is permissible for counsel to dispute his own witness, unless he quotes the same part I am quoting from.

Mr. Richey: I am not disputing, I am giving him a chance to keep you from confusing him, getting him balled up.

Mr. Bruninga: Oh, never mind, go ahead, Mr. Richey.

(Narrative continued) I say that in January, 1919, was my first contact with the Long piston by Mr. Long. Later on it was Mr. Long, but January of 1919 is my first knowledge of the Long piston, actually where I had something to do with it, but the reports showed in 1918,

July, but I had no work connected with that; the reports have given me that information.

Referring to Exhibit 43 piston, I will mark an X on the slot that I referred to as a T-slot. It was right there.

Q. Now, will you merit it on these other ones? A. It would be over here.

Q. Do you see it there in the drawing, the T-slot you refer to? A. Yes, I can see this one right in here.

Q. All right, mark it right on that, will you? A. (Witness complies.)

Q. Now, do you see it on any of the other views? A. I don't know as I do.

Q. Now, where is the rib B on this piston shown on Exhibit 43? Will you mark that with a Y? A. This rib here, you mean?

Q. Yes, the one you referred to. A. (Witness complies.)

Q. In the other figures where is that? A. That would be this rib right here. It is not on there, though. That is the only place you can see it.

This Exhibit F piston is a lot like the Long pistons that I put into an engine in March 1919 because it is a sand cast piston, but I can't say whether or not the pistons of the original installation had this relief at the wrist pin bosses. When I said the Exhibit F piston and the Long pistons installed by me in March 1919 were alike, I didn't mean with respect to the relief. I told this gentleman over there (Defendants' Counsel) I wasn't sure the relief was on or off.

Re-Cross Examination by Mr. Brumings.

Referring to Exhibit 43, this view on the left, reading the sheet with 43 and the rectangle at the left down, this view at the left is a cross section taken right through the wrist pin boss.

Q. Now, what is this line over here which I will mark? A. That would be one of the slots, top slot.

Q. That line that I have my pencil right on now? A. That I think would be a continuation of this one right here; in other words, that slot there would run into that portion of the head right there.

Q. Will you put a mark "N" at the part that you said was the top? A. Yes.

Q. The top of the T, isn't that right? A. Yes, that is right.

Q. Will you point to me what was the vertical of the T? A. Right here, that runs into this one.

Q. You mean that line that I have marked "M," is that right? A. Yes; that would be the same slot carried down.

Q. And that slot ran from the bottom of the piston right into the slot "N," is that right? A. Yes.

Q. How far around did the slot "N" go? A. That went all the way around, I am pretty sure.

Q. All the way around the piston? A. Yes; I wouldn't swear to that, though, either.

Q. I think you said the top part of that slot was more like the one— A. I won't say that slot went all the way around.

Q. —shown in the Long piston? A. Yes, like on that order.

Q. Like on Fig. 2 of the patent 1,394,441? A. Yes, sir.

Q. And then on the opposite side from the slot there was this rib, there was this rib that you marked "Y" that runs in a dotted line from along the skirt and into the top of the head? A. Yes.

Q. Is that right? A. Yes.

Q. And there was just one rib in the center? A. There was that one rib carried up here.

Q. And the vertical of the T— A. Probably right from here right up to there.

Q. At the point that I will mark "M"? A. Yes.

Q. And the slotted part of the T around the piston was at the part where you marked "X"? A. Yes.

(Narrative continued) I never heard of the Long piston until 1919. The records tell me the piston was tested in 1918, in July, but I have no personal recollection of that 1918 test. I had nothing to do with these 1918 tests, not even with the record of these tests.

Mr. Bruninga: That is all.

Re-Direct Examination by Mr. Richey.

These two parallel lines marked "A" on Exhibit 43 look like a relief for the wrist pin bosses, but I don't notice any relief and I can't see that there is any. I don't know what those two parallel lines running down there are.

These two parallel lines which you have marked "B" indicates a slot in the piston?

Q. Will you compare the two parallel lines shown at B with the two parallel lines shown at A?

Mr. Bruninga: That is very clever leading, Mr. Richey, I must say.

A. I can't.

(Narrative continued) I don't know what is shown by the parallel lines at A; I can't dope out that. The parallel lines marked C in the bottom view look like slots.

Q. Now, are those lines shown in the view above the one that I marked Fig. 5?

Mr. Bruninga: I will let you go ahead, because I think you will fall into your own trap.

The line C looks like a slot to me. Fig. 4 doesn't show it. This looks like the bottom of the piston to me, Fig. 5. What is this? This is supposed to be the bottom of the piston looking down?

Mr. McCoy: That is looking up from the bottom.

The Witness: Like looking down through here (indicating on physical exhibit)?

Q. Yes. A. Well, it looks as though those were slots that appear in the end of the piston, these here."

I don't know how they designate these slots on the piston, I just took it for granted that was a slot and this was a slot. I said X was a slot, and that B is a slot. X, B and A look all the same to me; they look like slots, they look like saw marks on the piston. There is not anything on this drawing that leads me to believe there is a slot at M, but that is there; I guess that is the center line. The line I marked M in Fig. 1 and a mark in Fig. 3 is a center line. It doesn't look like a slot.

Q. Now, as a result of looking at the drawing closely will you state whether or not there was a slot at M in that piston?

Mr. Bruninga: I object to that, now, your Honor, I think this has gone just about far enough.

The Master: Yes, I sustain the objection.

When I say this is a center line at M, it looks like a line drawn down through the piston, that is all. By "center line" I mean, looking at the piston that way, a line cut right down through there, brought right down through that dimension.

Q. Would the center line show up in the piston itself?

Mr. Bruninga: I object again to it as leading.

That line M don't look like it is a physical part of the piston. The purpose of the center line is for setting

up their work, of making a drawing on that particular paper, as an aid to the drawing.

Re-Cross Examination by Mr. Bruninga.

Having reference to the type A piston, and Fig. 2 of patent 1,395,441 and Figs. 1 and 2 of patent 1,489,499, if I recollect the piston, it looked like Fig. 2 of patent 1,395,441. I don't have any memory at all whether it looked like Figs. 1 and 2 of patent 1,489,499.

Mr. Bruninga: Those patents are in the record. That is all.

Mr. Richey: How about those records (H. H. Franklin Development Reports), do you want to look them over?

Mr. Bruninga: No, I don't want to look over those records, I haven't got time for that, and besides they are not direct from the Franklin plant at all; I don't know where they have been between the time they have reached your office.

Mr. Richey: I will have to put Mr. Edgerton on for a few questions before we go ahead with Mr. Gulick.

A. H. Edgerton, a witness called in rebuttal by Plaintiffs, being first duly sworn, testified as follows:

Direct Examination by Mr. Richey.

I am of mature age and a member of the firm of Richey and Watts.

I went to the Franklin plant recently, and I saw there, first, the patent attorney, Mr. Bodell, received his permission to go into the Franklin plant, and there I met Mr. Castor. Mr. Bodell accompanied me to the plant. I met Mr. Castor there and we went up into the engineering department of the H. H. Franklin plant, at Syracuse. Mr. Castor made a search for the records, the records which we have before us here in the court room. I was present throughout his entire search. The search lasted the greater part of the forenoon and during the time we had Mr. Chadwick, a former employe of the Franklin Company, come in, and he also searched, and these records were developed in that search. I mean the mechanical and experimental records which we have before us, of which Exhibits 42-A, B and C, and the remainder are on the chair there before the Court. Those are a part

of the records found by Mr. Castor. The remainder—they started, I think the first year was 1910; they ran up to 1932, inclusive. These are records from 1916 to 1919, both inclusive. Those are all the records they found for those years. After they were found, Mr. Castor sat down at the table and looked through them. I sat at his side and as he would finish them they were passed to me and I made a cursory review of them and then I brought them to Cleveland with me. I brought to Cleveland with me all the records Mr. Castor found for those years. These records that I have produced here, are all the records that I brought, including the three that have been separated therefrom which are marked A, B and C.

Mr. Richey: That is all.

Mr. Bruninga: No cross examination.

Mr. Richey: It may be understood we can send those back that are not offered in evidence?

Mr. Bruninga: Yes, you can do whatever you want to.

Thereupon, the Plaintiffs called as a witness in rebuttal, EDWARD J. GULICK, who being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Edward J. Gulick; I am 63 years old. My residence is Elkhart, Indiana. I am now engaged in the manufacture of automotive specialties. I worked with the Amplex Motor Car Company, Mishawaka, Indiana from 1904 until shortly before the 1st of September, 1910. My position with that company was secretary and general manager for that company in 1908. The Amplex Motor Car Company were manufacturers of four cylinder, two-cycle automobile engines.

Shortly after the 1st of September, 1910, I went with the Excelsior Motor & Manufacturing Company, Chicago, as Factory Manager, and remained with them until shortly after the 1st of November, 1911. This company manufactured automobile motors, motorcycles, and bicycles.

After leaving the employ of the Excelsior Company, I was in the East a big portion of the time engaged with a man by the name of Pulsifer for a period of two or three years in an attempt to establish another automobile institution, and just prior to my going back to Mish-

awaka with the Amplex Company in 1912 to 1914, we were engaged in an attempt to raise enough money to buy the Amplex Company from the receiver. We finally accomplished our purpose, and we went into operation in the factory about the first of 1914, and I believe we gained possession through the receiver along about June or May, 1914. We were working at the factory prior to taking it over from the receiver. I was at Mishawaka during that period. That was the factory of the company with whom I had worked in 1908, that is, the same factory and same name. In 1914 we operated under the name Amplex Motor Car Company, from about the first of the year 1914 until November, 1914, when the company went into the hands of a receiver again.

Some patents have been issued to me, and to the best of my recollection the subjects varied from bicycle to automotive—musical instruments—special machinery—I would say at the very least 50 patents, I don't know the exact number.

I have made some piston inventions. The first sketch of piston I made was in January, 1911. This was a piston with a slot going around the top, and a split skirt, and ribs extending from the head down to the piston pin bosses. The piston pin bosses weren't connected to the skirt but the ribs were connected to the skirt. The idea of this piston was to permit it to collapse under heat so it wouldn't seize; that was the object of the slots. This invention was made prior to 1911, the latter part of 1908. The circumstances surrounding this invention were, our two-cycle motors were large bore and we had a great deal of trouble with piston slap and piston seizing because of the excessive heat in the two-cycle engine, and I conceived the idea of slotting the piston to get rid of that difficulty. However, I found out it wasn't practical with the two-cycle motor, with the slot at the top and slot at the side, because of not covering the port holes, there were no valves in the two-cycle. The piston itself served as the valve in the two-cycle engine, and the slotting of the piston would interfere with the operation of the motor.

I next became active with my invention in January 1911, at which time I made a sketch of it. I place this date through the fact that my wife and I went to Syracuse through the holidays, and we returned the second day after New Years, to Chicago. I made a sketch of it during that time and showed it to her, and in the last week of January, 1911, she went to Florida and didn't

return until about the latter part of April. I made a partial description of that invention at that same time, which I showed to my wife. After my wife went to Florida, I wasn't home a very great deal, I took my meals downtown, I lived in Englewood, and it was very seldom while she was away that I got home before 11:00 or 12:00 o'clock at night. For that reason the description wasn't completed but remained as a sketch until later on; and it remained in my possession until it was turned over to either Pond or Tibbets. I also showed my wife the drawing of my invention at the same time I showed her the description. I believe I could reproduce at this time the characteristics of the piston that I showed in that sketch.

(Thereupon, a short recess was taken while the witness reproduced the sketch.)

Mr. McCoy: The witness has produced Exhibit Drawing, Plaintiff's Exhibit 44.

(Narrative continued) Part 1 of the piston shown in Exhibit 44 represents the head of the piston, 2 the skirt, 3 the ribs, carrying the bosses 4 to the head 1. 4 are the piston pin bosses, 5 the slot. The slot 5 is located just below the lower piston ring and extending circumferentially around the piston, 6 the diagonal slot which splits the skirt, dotted line 7 represents ribs extending to the pressure side of the skirt opposite from the slot 6. The object in showing this was to make it possible to use what is known as the shoe-type cross-head with the bearing surfaces on the pressure side only. The pressure side is the side which is forced close to the wall or tightest to the wall under the explosion, under the firing of the engine. It probably would also be called the explosion thrust face of the piston.

I would recognize the sketches and the descriptive matter that I made in 1911.

Exhibit 36 is the sketch which I made in January, 1911, and Exhibit 37 is the incomplete description that I made in January, 1911. Exhibit 37 is a description of the piston sketch Plaintiffs' Exhibit 36. I recognize the sketch Exhibit 36, and the written descriptive matter, Exhibit 37, because I doubt if anybody would make a sketch like myself, and of course I know that it is my own, my own work, also my signature appears on it, and the descriptive matter is in my handwriting.

Referring again to Plaintiffs' Exhibit 44, on which I have shown a dotted line marked with the numeral 7,

that was a modification of the piston shown. I find the same modification shown in my sketch Exhibit 36. Explaining more in detail the character of that modification, that was for the purpose of constructing a piston with ribs extending only from the boss, from the piston bosses to one side of the skirt, that is the pressure side, and the idea being that more contraction of the piston by so doing might be possible, or would be possible. This construction merely was a modification of the original sketch, on the original sketch.

The descriptive matter identified as Plaintiffs' Exhibit 37 reads as follows:

> "Relating to an engine piston which provides for and prevents seizing, binding and scoring when hot or oversize. It is a well known fact that all engine pistons are necessarily made smaller than the cylinders in which they operate to provide for lubrication and prevent seizing or cutting due to the expansion of pistons in cylinders when hot. (1) the piston consists of a head 1, and having a groove 6 for carrying packing rings and a body 2, which provides bearing surface and which is split as indicated by 7, to provide for expansion. (2) The head 1, and the body 2, are held together by the ribs 3 and 4. The ribs 3 and 4 carry bosses 5 for receiving the piston pin. Ribs 3 and 4 are not limited to shape or position, and the number of ribs and location and shape may be altered as desired. Head 1 is machined small enough to allow for expansion and not bind or seize, while the body 2 is machined as close to the size as is possible to make a fit, and any expansion is taken up by the slot 7, and which prevents any seizing, or binding between the pistons and the cylinder walls in which the piston moves. By this construction it is possible to make a fit that prevents any pounding, which is prevalent with the common type pistons."

The purpose in writing up that descriptive matter was to apply for patents.

The Mr. Pond to whom I referred was a patent attorney in Chicago. This is the paper that I referred to as being submitted to Mr. Pond. These papers, Exhibits 36 and 37, were in Pond's possession and were returned to me in the early part of the year, I believe in February of 1916. At that time I sent them to the Packard Motor Car Company, because I was negotiating with the Pack-

ard Company for the sale of a number of old patents, and the piston, this piston, this type of piston, with some other inventions which were not in the Patent Office, were wanted by the Packard Company, this piston was amongst the exhibits shown as an exhibit. A lawsuit which I had with the Packard Company led up to the submitting of these particular papers to the Packard Company. This suit was for royalties on some patents which I owned on their rear axle construction. I don't remember when that suit was brought, but it was between 1912 and 1914.

In order to try out this invention after the sketch was made, I made up a set of pistons and put them in an Excelsior motor in 1911, of the four-cycle, four cylinder type, and drove them on the road. I made other tests at that time. There were two sets of pistons made, one to be used in the car and one to be used on the test block. The pistons were tested on the test block; I didn't test them personally. Those were the only two tests made at that time, in the car and on the test block.

That piston which I sketched up was designed particularly with the idea of making a perfect piston for the purpose of applying it to a sleeve motor.

Concerning the character of test that I made in connection with the use in the automobile, the car was a Renault type, experimental, and made up by the Excelsior Company. The motor was an Excelsior motor. The pistons were standard Excelsior pistons and were slotted on one side only just below the lower ring, and then split diagonally to the bottom of the skirt from the slot. My instructions were to have the pistons split in the tool room by Mr. Johnson. He did only part of the work and the other portion was done by a man by the name of Engle in charge of the experimental department. The piston used was a standard Excelsior piston secured from the Excelsior Company. The piston was taken out of stock; I purchased the pistons but they were taken out of stock. Those pistons were fitted in the cylinders very close. I don't know the man's name who did the fitting, but the pistons from the Excelsior Company, I might say, owing to the variation in the bores of the cylinders were carried in stock rough turned, rough finished, as in many cases we had to grind pistons oversize or undersize to make up for this difference. These pistons were selected for this motor and ground to size of the cylinder, very close fit. By very close fit, I mean they were fitted so that they could just be moved through the cylinders by hand and sustain themselves when dry.

The part of the machining of the piston which was left uncomplete, as I have testified, when the piston was brought to me by Mr. Johnson, was the vertical slot. The slots had been milled or cut in from between the two bosses on one side only. I didn't receive the piston; it was turned over to the experimental department and Engle cut the angular slot from the top slot that they milled in the skirt. Those slots were cut clear through the skirt. We made no change in the structure of the standard type of piston other than the slots.

I have since made up a pis'on of the same general character to illustrate the type of pisten that I made at that time in 1911. That piston was made in 1914 at the Amplex Motor Car Company. There were only two sets of pistons made in 1911 but I never made up any after that. There was a pisten made up for your (Mr. McCoy's) use in the interferences, according to my sketches, according to my lay-out.

I testified in Patent Office Interferences 49,569, 49,570 and 49,571.

I would recall the standard type of piston that was being used by the Excelsior Company in 1911 when I was with them, and would recognise a blueprint showing that piston.

(Witness handed blueprint marked Plaintiffs' Exhibit 45.)

I recognise that blueprint, Plaintiff's Exhibit 45, as a print of the piston used in the Excelsior motor in 1911. That is the character of pisten that I modified in 1911, as I have testified. I would recognise the piston itself if I saw it.

(At this point the testimony of Burns, Record pages 674 to 698, and Edgerton, Record pages 698 to 699, was taken.)

(Thereupon, EDWARD J. GULICK, being recalled further testified as follows, in answer to interrogatories by Mr. McCoy.)

My position with the Excelsior Motor & Manufacturing Company, at Chicago, Illinois, was Factory Manager, and I had factory drawings from which to make up the parts of the standard motors for the Excelsior Company. Those drawings were under my supervision. I would recognise blueprints from the standard factory production motor drawings.

(Witness handed a blueprint marked Plaintiffs' Exhibit 45.)

That print Exhibit 45 is of the standard Excelsior motor piston. Without examining that print, I don't remember whether the skirt of the pistons for use in our standard motors was ground absolutely straight or not. There was some clearance on the head, of course, from the lower ring up, but I don't remember just how much clearance was given. The blueprint of the standard motor piston would show me how it was ground. After examining this blueprint, Plaintiffs' Exhibit 45, I find that according to this print they were ground .002" taper from the bottom end of the skirt to the top of the piston head. According to this print that was a uniform taper. That is my recollection as to the way they were ground, because that was standard, whatever this print shows was standard construction; they were ground according to this print. This print accurately shows the character of piston that I said was modified for my test purposes in 1911. I would recognize one of the pistons that were used in the Excelsior motor as standard equipment at that time.

(Witness handed the piston Plaintiffs' Exhibit 47.)

I would say that this is a fair specimen of the pistons used as standard equipment in the motors manufactured by the Excelsior Motor & Manufacturing Company at the time that I was connected with them.

Some time ago I prepared for you (Mr. McCoy) a piston that was modified to make it the same as the pistons I tested in the motors at the Excelsior Motor & Manufacturing Company in 1911. I don't recollect what year that was; it must have been along in—I can't, I don't remember what year that was. It was at the time the evidence was taken in South Bend, at the time the testimony was taken, about that time.

By Mr. McCoy: I hand you a piston marked Plaintiff's Exhibit 48, and ask you how this piston compares with the one that you used for testing purposes at the Excelsior Motor & Manufacturing Company in 1911?

By Mr. Bruninga: I would like to make an objection. This particular construction is utterly immaterial to the issues of this case as far as the Gulick patent is concerned. My position is that it is

not contemplated by the Gulick patent at all, by the claims in connection with the specifications, and therefore I want to make this objection. Your Honor can see what the construction is.

The Master: What do you claim for it?

By Mr. McCoy: Our claim is that this was a part of Mr. Gulick's tests that were carried on by him prior to the time of filing his application for patent in order to test out his ideas on that piston.

Mr. Bruninga: Will you tell the Master whether you consider this construction coming within the scope of the Gulick patent?

Mr. Richey: Why, we will not say on that subject at this time. We ask the question to show the activity of Mr. Gulick on these pistons, and it is competent at least as corroborative of the other work he has done.

Mr. Bruninga: I want counsel to state his position right now whether he considers that construction within the scope of the Gulick patent.

Mr. Richey: We decline to state it.

Mr. Bruninga: Then it is utterly immaterial to the issues of this case.

Mr. Richey: It is material at least as to the activity of Mr. Gulick on these pistons, and it is corroborative of the work he did.

The Master: I am not passing on it yet. How can it be material if it is something else he was doing long before he made his application and before he was doing work on this particular piston?

Mr. Richey: Well, very often this kind of work is unusually competent to show how the man works up to a certain thing, and it is a certain thing as evidence that he did do that thing. For instance, often an inventor will do something that is a failure, while the fact he did that is competent evidence to show how he worked up to the thing that was a success.

The Master: I am not so sure about that, all of his failures, whether you can bring those in.

Mr. Richey: Well, I am not saying this is a failure.

The Master: I understand.

Mr. Richey: Very frequently in taking this prior invention testimony you put in evidence of what the man did to show how he worked up to the thing that was finally relied upon.

Mr. McCoy: May it please your Honor, this witness has already shown he made sketches in January of 1911 and that these experimental tests were made subsequent to that and along the lines of the invention that he showed in the sketches; he has already testified about those made by him in January of 1911, together with the descriptive matter relating to the same structure shown in the sketches.

(Further argument had.)

The Master: I think I will receive it over the objection.

The Witness: It is the same.

(Witness handed piston, Plaintiffs' Exhibit 48.)

That piston came from the Excelsior Motor Company. I don't remember just where that machine work was done. I believe that was slotted in South Bend, but I don't remember who did that. It was done under my direction. It was done for the purpose of showing how the pistons that we put in the Excelsior Motor were slotted.

Q. Did you try to make that as nearly identical to the piston that you put in the Excelsior motor as you could?

Mr. Bruninga: Object to that as leading.

The Master: I think it should be sustained as to that.

Q. What was your purpose in making that piston at South Bend? A. Well, to show how the Excelsior motor pistons were constructed.

(Narrative continued) After the pistons were slotted for me at the Excelsior Motor Company, as I have heretofore testified, they were installed in the Excelsior motor and put on the experimental block, run for several hours and the motor was then installed in one of the Excelsior Motor Company's test cars. That car was driven by me from the latter part of July until just prior to November 1st. In fitting that piston to the motor, there was no specified clearance given; they were ground just as close before they were slotted as they could be shoved in dry by hand and be moved through the cylinder walls. After that operation was completed, they were slotted, and then they were installed in the motor under my instructions. I didn't put them in personally. I did not see them put in. I saw them outside of the car; I saw them

when they were finished, saw them just the time they were preparing to put them in.

After the motor having these pistons in it was installed in the car, it was driven to the Elgin races; that was in the latter part of July, as I remember, that is the first day they were ever driven in the car. After that I drove it continuously until, I believe, the latter part of August or the 1st of September, and broke a crankshaft in the car. The same pistons were installed when the new crank was put in. Later, about the 1st of October or shortly after, I made a trip to Mishawaka, a man by the name of Williams, his wife, my wife, and myself, and on the return trip trouble developed at a speed of about 30 miles per hour, and I wasn't sure what the noise was, but on my return we found that one of the pistons had cracked from the slot across the top through to the boss. The crack occurred from this slot (indicating to the Court) through to the hole, through to the piston pin hole. Then there was another piston fitted, and the job was driven from then on until just prior to November 1st. The pistons were then removed, standard pistons put back in, and the car was sold. That was just prior to the 1st of November.

The parties who went with me to the Elgin races were Morris Engle and my wife and a man by the name of Grubb and his wife. That was the Morris Engle that I previously mentioned as having slotted the pistons longitudinally.

I made other tests on these pistons during that period, during the period in which these pistons were put in and the others were taken out. The other tests were the same type of pistons on the test block. Morris Engle did the testing.

Q. What were the results of it? A. Well, they ran perfectly.

Q. What did you observe as to the fact as to how the performance was? A. Well, there was less slap in the pistons, they didn't pound, not so much, and there was no seizing or scoring.

Q. How were these pistons fitted, if you recall? A. The same as in the car, very close fit.

(Narrative continued) After these pistons were tested The Excelsior Motor Company quit making motors and we were instructed not to make up any more parts and dispose of everything that was on hand; and these pistons were taken out of the car, other ones put

in, as I say, it was sold, and the test motor used, an old motor that we put these in, usual type of cylinders on, and those pistons were taken out of that motor, and it was sold along with the rest, and the pistons were in the experimental room up until the 11th of November when I left there, and I never saw them after that.

I carried on other experimental work with slotted pistons for motorcycles while at the Excelsior Company. That test was started sometime in the latter part of May, and those pistons were very light construction, were used in an air-cooled motor. They were very similar and practically the same type of design as this, but much lighter in proportion, and the result was that being a very high speed motor, driven up around close to 4000 at its maximum high speed, the pistons didn't stand up, they were broken loose at the boss, the piston pin boss. This was in 1911.

I would recognize the Excelsior Motorcycle pistons of the character I tested at that time.

(Witness is handed piston marked for identification Plaintiff's Exhibit 49.)

This piston is the same construction as was tested in the Excelsior Motorcycle.

Q. Will you indicate to the Court just where you formed the slots in this piston? A. The slot was cut across the face of the piston. Want me to mark it?

Q. Yes. I doubt if it will show. A. Well, the slot was cut across just below the piston rings, down as far as about that position, down close to the piston head (indicating), the same as on the other motor. Then it was slotted diagonally down the skirt, same construction, same slotting as done in the Excelsior motor piston.

(Witness is handed blueprint marked for identification Plaintiff's Exhibit 50.)

I recognize this blueprint as a print of the Excelsior motorcycle piston. I will make a mark on the blueprint indicating the position of the slotting that was made by me in the piston tested out at Excelsior Motor Company plant.

(Witness makes mark with red pencil on exhibit.)

I will also indicate the position of the horizontal slot in the top view of the piston shown in the blueprint.

I will put it on this half side, because that is where it belongs, only it would have to extend across, if it was the full view.

(Short recess taken.)

I have never been connected with the testing or manufacturing of a motorcycle at any place other than the Excelsior Motor & Manufacturing Company. I left their employ on November 11, 1911, because the plant was in the hands of a creditors' committee and was sold to a bicycle manufacturer by the name of Schwinn. They continued the manufacture of motorcycles and bicycles, but abandoned the manufacture of Excelsior motors. With respect to the testing of the slotted pistons, there was nothing done in the way of making other pistons until in 1914 at the plant of the Amplex Car Company at Mishawaka. On that occasion we were designing and preparing to build a new sleeve valve motor, and in that motor was incorporated a piston of mine of better mechanical design in order to carry out further the experiments that I had tried out at the Excelsior Motor plant. We put a set of similar pistons in a Buda six-cylinder motor that was used in an Amplex car; they were made of aluminum. That experiment was for the purpose of finding out what effect the slotting of the piston would have towards benefiting or stopping the seizing and cutting and relieving the high wall pressure.

Reverting again to the motorcycle test that was made of the Excelsior, I cannot exactly recall how the motorcycle piston was ground, but I believe it was ground with a very slight amount of taper. The drawings would indicate how it was ground.

(Referring to Plaintiff's Exhibit 50.)

This print shows taper of .001" smaller at the head end than at the bottom of the skirt.

The castings for the pistons that were tested at Mishawaka, as I testified, were made at the Rockhoff factory at Mishawaka. This foundry was located right across from the Amplex Motor Car Company, and the material from which these castings were made was aluminum, manganese aluminum, supposed to be magnesite and aluminum, some mixture.

Recalling the details of obtaining those castings, the patterns were not our property. I believe they were secured either from the Rockhoff Foundry or else from a man by the name of Williams, who did some experimental work, and they were practically the same size and

same dimensions as what we wanted with the exception of diameter. They were pasted up with a pasteboard around them in order to get the piston of proper diameter, and the core box was a single rib core box that was changed to double rib, extending from the piston pin boss to the top of the head. Then the piston, in machining the slot, was cut completely around below the lower ring through to the two ribs which extend down from the head, just through to the ribs, so it carried the skirt clear around, and just to the ribs; and it was slotted diagonally, the same as on the Excelsior job. Explaining more in detail the position of the diagonal slot referred to by me, the diagonal slot was on the compression stroke, not on the pressure side. The diagonal slot with reference to the piston pin bosses, extended from the slot which was around the piston, above the bosses to the bottom of the skirt. I think I could reproduce in a drawing fairly closely the general character of that piston.

(Witness is asked to reproduce in a drawing the general character of that piston, and is handed blank sheet marked Plaintiffs' Exhibit 51.)

Mr. Bruninga: I would like to have my same objection go to Exhibits 49 and 50 as to the previous Exhibit 48.

The Master: Same ruling.

(Short recess taken while witness makes sketch.)

As to the numerals on Exhibit 51 which I have applied to the various parts of this piston, 1 indicates the top head of the piston, 2 the lower skirt, 3 the piston pin bosses, and 4 the slot running around the piston. The slot cuts the skirt loose from the head and extends into the ribs, into the edge of the ribs 6, of the piston ribs 6. 5 indicates the angular slot cut up through the skirt to the slot 4, the slot 5 extending all the way through the skirt wall. It extends from the lower edge of the skirt 2 up and into slot 4, connecting with slot 4.

As to the relative dimensions between the head and the skirt of the piston that I am testifying about, to the best of my recollection the head was about, say, approximately, the head where the rings go in, was approximately .005" smaller than the skirt. The piston was fitted in the engine cylinder with a very close fit, just as close as they could be comfortably put in by hand. A man by the name of Johnson machined those pistons at the Amplex Motor Car Company, Mishawaka, in either

the latter part of July or 1st of August, 1914. After the pistons were machined, they were put in a six-cylinder Buda motor, in a car, at the Amplex Motor Car Company, Mishawaka. The car was an Amplex car which belonged to me. The Buda motor in which these pistons were placed had six cylinders, and it was water-cooled. A man by the name of Hoadley put these pistons into the car. I don't remember his nickname. As to his general appearance, I believe he was sort of a dark complexioned man about my size, as near as I can remember.

I showed these pistons at the Amplex Company to Hoadley; a man by the name of Duck saw them, Johnson, a man by the name of Ort, I believe it was, and I presume others there; I can't name them all. Mr. Randall was with the company at the same time that I was. I can't say for certain whether or not he saw them, but I am quite sure he did. He saw the castings and he might have seen the finished job.

I believe the proprietor of the foundry across the street from the Amplex plant from which we obtained the castings, was named Rockhoff, I believe that is the man I dealt with. I don't recall anyone else at the foundry at that time, I wasn't acquainted with any of those operators over there, particularly.

There were seven castings made in the first place. I say "in the first place" because the first run of castings that we made were full of blow holes and they were bad. We made one extra in case one did go bad in machining. Then they were made over and after one or two runs we succeeded in getting enough for the car.

After we installed the pistons such as illustrated in my sketch, Plaintiff's Exhibit 51, in the car, I took it out and drove it, drove it continuously from the time the pistons were put in, which I believe was in the latter part of July or in August, and drove it from then until around about the 1st of November. I had driven the car, previous to the installation of these pistons, several hundred miles. Prior to the time that I installed these pistons illustrated in Plaintiff's Exhibit 51, the pistons in the car were about of the same construction as the Excelsior, practically so, as the Excelsior piston. They were not split skirt pistons. They were gray iron pistons.

Q. Did you observe the performance of the car after the pistons such as illustrated in Plaintiffs' Exhibit 51 were installed in it? A. Yes.

Q. What did you notice? A. Well, it was much smoother and there was less roughness in the motor.

Q. Could you tell the difference between the operation of the motor when it had the iron pistons in and when it had the aluminum pistons? A. Yes.

Q. Was that difficult to detect or readily detectable? A. No, it would be very easy.

Q. You have stated you drove the car continuously for some period of time. Do you recall how long it was that you drove the car with these pistons in it? A. I drove it from the time they were installed to about the 1st of November, just prior to the 1st of November. I then had the pistons taken out. I went east two weeks, about the middle of October I went to Syracuse, New York, and I instructed the boy to take the pistons out while I was gone, and to install the original pistons. And I came back the 1st of November and the change had been made, but the reason for that change was I had a chance to sell the car and get my money out of it, and I couldn't let it go with experimental pistons in it.

(Narrative continued) I know of my own knowledge that that change was made, because I could tell when I took the car out of the garage after the change was made. I was boarding at the Mishawaka Hotel, and the car was brought down and left in that garage next to the hotel. I came in at 4:00 o'clock on the 4th of November, and took the car out of the garage. I could tell immediately the original iron pistons were in by its action and by the feel of it. I place that date by the fact that that was the date the receivership was closed, the receivership of the Amplex Motor Company by the bondholders of which Kam was one of the principal bondholders, taking it from Pulsifer as trustee and myself, who had purchased it from M. W. Mixx as receiver of the Amplex Company in the early part of 1914.

I didn't always own this car in which these pistons were installed. The Amplex Company owned it prior to me, and I acquired the car directly from the Amplex Company in July, I believe it was, the latter part of July, either the latter part of July or August of 1914.

The circumstances regarding the purchase of this car from the Amplex Company, were, that I had loaned the Amplex Company about $900 and I took the car in payment, for which I received a bill of sale for the car, which bill of sale I can produce. This is the bill of sale.

(Bill of sale, Plaintiffs' Exhibit 28, produced.)

I believe that bill of sale was handed to me by Mr. Randall's assistant. I know I got it from the office. I then asked him to make a notation as to the number of miles that was on the car when I took it over, because it was equipped with the new pistons, as the date that this bill of sale was delivered to me, and this notation was made on there, either by Randall or by his assistant, merely a notation of the mileage when the pistons were installed in the motor. That notation was undoubtedly made on there the same date the bill of sale was made, at least the day I received the bill of sale. I have already stated that I received the bill of sale the latter part of July or early part of August, but this bill of sale is made on July 16th. If it was made on the 16th, I probably received it on that date. It was on or about that time, anyway. As to the notations on the back of this bill of sale, the notation on the top is to Ralph Jernegan, an attorney in Mishawaka. It says,

"This mileage 6112 when car was left in garage and was not driven but little after until Cook received it. (Signed) E. J. Gulick."

I will read into the record the writing on the front of the bill of sale that I have referred to as being placed there at my request on or about the date on which I received this bill of sale:

"Miles on speedometer 816. New type pistons in motor."

The statement, "New type pistons" refers to the aluminum pistons, of a split skirt character, illustrated in Plaintiffs' Exhibit 51. I am referring to the notation on the back of the bill of sale and to the notation in red ink on the front of the bill of sale. Explaining what I mean by that, after my return from the east in November, 1914, the car was turned over to a friend of mine in Elkhart by the name of Atkins. The aluminum pistons, however, had been taken or removed from the car around about the first of November, 1914. Mr. Atkins sold this car to a man by the name of John Cook for me, and dissipated the proceeds to his own pocket, and this notation on here when this bill of sale was turned over to Mr. Jernegan, attorney, was the mileage that was on the car when Mr. Atkins turned it over to John Cook. That covers the notation on the back.

As to how far the car was driven during the period that it had the aluminum pistons in it, I would say that I placed at least 3000 miles on it.

These aluminum pistons such as we have illustrated in Exhibit 51 were my personal property because I wanted to carry out the experiment, I wanted to install them in my car, and as I had made no assignments of any of the properties, patents on the sleeve valve motor, to the Amplex Motor Car Company, I didn't want anything tangled up until all of the affairs of the institution were in form, and at that time if they had matured, why, then, all of these applications were to become assigned to the Amplex Company. So for that reason I kept them separate, purchased the pistons myself and had them machined myself, and they went in as a part of the bill on the car. By purchasing of the pistons I mean that I ordered the pistons from the Rockhoff Company and I paid for the pattern work, the changes which were made in the core box, but the bill for the aluminum pistons was sent to the Amplex Company by Rockhoff and I paid the Amplex Company, for that came out of what they owed me. I paid the Amplex Company for the machining of these pistons. The Amplex Company paid Rockhoff for the castings that were made into these particular pistons that were installed in this car, the pistons being illustrated by Plaintiffs' Exhibit 51, and I paid the Amplex Company for them. They were paid for in advance because of the fact the Amplex Company owed me much more than my bill for the car and the price of the car. These pistons were mine at the time I bought the car. The pistons were installed in the car about three weeks after I had finished the motor for the car. With respect to the time when the bill of sale was made out, the installation of the pistons was completed practically the same day that the bill of sale was made out, or the day after. In fact, I know it was after the bill of sale was made out because on this date Randall called my attention to it and the credits were made on the books and the bill was in his office, as I recall, and they were working on my car then, but the car was my property prior to that bill of sale. I regarded the castings as my property when I received them from the Amplex Company. I never regarded those piston castings as the property of the Amplex Company; they never were.

As I previously testified, a sleeve valve engine construction was being worked on at the Amplex Company. This engine was being developed under my supervision.

Q. Will you explain to the Court the general features of this engine?

By Mr. Bruninga: Before that question is answered, I would like to make my objection to all this evidence with reference to Exhibit 51 on the same grounds made against 49.

The Master: Same ruling.

By Mr. McCoy: Exhibit 51 is offered in evidence on behalf of the plaintiff at this time as Plaintiffs' Exhibit 51.

By Mr. Bruninga: I want to make my objection to its offer.

A. The motor was a new design of sleeve valve. The general characteristics of this sleeve valve motor were that it had two half sleeves, sliding, working in between an inner liner and a main cylinder wall.

There were other characteristics of this motor that were new at that time, namely, it was fitted with a new design type of cross-head piston with slit skirt, slot around the top. My ideas were incorporated in that piston, and no one else's.

I disclosed the piston to Winchester, I believe, some time in April, 1914. The circumstances of that disclosure came about in a general discussion of the new motor and how various details and various features of the motor ought to be built and what was to be incorporated in it. That disclosure took place in a conference, and I also gave Winchester a sketch of the piston of the general form, to give him a general idea. That was the sketch I made in January, 1911. I had the sketch in my possession at that time, but not continuously from January 1st of 1911 until I showed it to Mr. Winchester. It was in the possession of James Offield, along with the original drawing of the sleeve valve motor, for a few months, I don't know just how long.

James Offield was a patent attorney in Chicago. It wasn't carried through by him because of the fact he married one of Wrigley's daughters and took over Wrigley's business and went out of the patent office business, as I understand it. The original drawing of the sleeve valve motor, and this sketch I am speaking of, were then returned to me, at which time I showed them to Randall. The sketch I am referring to is Plaintiffs' Exhibit 36.

The written description, Plaintiffs' Exhibit 37, was never entirely completed. There have been no changes

in the sketches or written material since I first prepared them in January, 1911. After I prepared the written material, Plaintiffs' Exhibit 37, it was in my possession, and during the time, or after I had written up the explanation as far as it goes on these sheets, I was home there very little in the evening, and I simply neglected to fill it out and carry it on, because, as I explained, my wife was in Florida, didn't get home until the latter part of April, and for that reason it kind of got out of the picture, and I laid it to one side, for that reason I didn't finish it up. Later on I delivered the written material in Plaintiffs' Exhibit 37, I believe it was first delivered to Pond. Mr. Offield had the sketch and the written material, Plaintiffs' Exhibits 36 and 37, in his possession, I imagine, for five or six months. He then returned it to me, it was in my possession until I gave the original sketch to Randall. When it was returned to me from Randall, he didn't have it very long, I turned it over then later to Pond. Mr. Pond is an attorney in the Monadnock block in Chicago, the same firm, Pond & Offield.

I believe Mr. Pond got possession of that sketch in the latter part of—I believe that was turned over to Pond in the latter part of 1915; I believe it was the latter part, sometime during the year 1915, I just don't remember the date, I can't remember. The purpose of delivering that sketch and the descriptive matter to Mr. Pond was that I made a deal—first, when I delivered it to Pond, the idea was to go ahead and take out the patent, then I made a deal with the Packard Motor Car Company to sell them some old patents which were originally owned by Amplex Motor Car, which were my patents, I was going to take them over and sell them to the Packard Motor Car Company. I made them a proposition on the sleeve valve motor, the piston, and some other things together with it, and then I turned all that material over to Pond to complete the deal, and this remained in Pond's possession, with some other prints and some other things and some other papers, until the early part of 1916.

This material and other prints, prints of the motor complete, and the whole business, were turned over to the Packard Motor Car Company; and the patents were turned over, not any patents referring to this but several other patents referring to the earlier Amplex cars. A portion of the papers and so forth were delivered through Pond, to, let me see—to Hibben, Davis & Macauley, who were Packard's representatives, and I think this drawing and print was delivered by me direct to Mr. Tibbetts.

By Mr. Bruninga: Objected to as hearsay.

The Witness: Well, I am positive I delivered this sketch with some other papers to Tibbetts. The descriptive matter, Plaintiffs' Exhibit 37, accompanied the sketch, Plaintiffs' Exhibit 36, at the time that I delivered these papers to Mr. Tibbetts of the Packard Motor Company.

The names of the attorneys in Chicago, who represented Packard Company in this matter, were Rector, Hibben, Davis & Macauley.

Drawings were made up at the Amplex plant, under my supervision, showing that sleeve valve motor with my piston embodied in that design. I would recognize those drawings and also blueprints of them.

(Witness shown a series of blueprints, marked for identification Plaintiffs' Exhibit 30.)

Referring to these blueprints, A38 represents the inner sleeves of the E.J.G. motor; they were made 7-3-14. The construction of this motor was started in April, about the 1st of April, 1914, and the detail drawings were carried on down through, of all the parts, until the final completion. The initials on here on this tracing is B.E.R., which would mean B. E. Rockhoff. Personally, I have seen all of these drawings, each and every one of them, and saw them at the time they were made. A60 represents the crankshaft of the E.J.G. motor. This is marked F.U.W., the initials of which mean F. U. Winchester. This exhibit is also one I am thoroughly familiar with, during the time of its design, and that was marked 7-16-14 at its completion. No number on this, this is the crankshaft, sheet number 1, E.J.G. motor, full size, dated 9-22-14. Well, I recognize in these prints the general construction of the motor which was my design and which I was attempting to patent and put through with the Amplex Company, the motor which the Amplex Company in fact was going to build.

Here is one marked "Oil pan" dated 10-8-14; that is the lower half of the motor; in other words, it is the oil pan of the motor. And "gear cover" under date of 7-14-14, it is for the same motor. I know who made these drawings. Winchester made practically all of the lay-outs. And much of the tracing was done by a young man by the name of Rockhoff and one other, I don't remember his name. I saw the drawings being made.

(Witness handed a blueprint marked Plaintiffs' Exhibit 31.)

This print is a sectional view through one of the cylinders and which shows the general construction of the motor and also shows the form of piston which entered into this design, and which was of the split skirt type. This particular blueprint came from the Amplex Motor Car Company. I know that because it was made in the drafting room of the Amplex Motor Car Company and was the first print that was taken of it or any of the tracings. I received as my personal property the first print that was taken off of every tracing. I recognize this particular blueprint as the first print that was taken from those tracings because it was never out of my possession until it was turned over to the Packard Motor Car Company. I know this because there never was a duplicate set of prints made. There is nothing on this particular print that causes me to recognize it except that it is a very old print and I am positive that nobody else ever had any besides myself. I don't know what happened to the original tracing from which that print was made. I presume they were burned up, destroyed. The last I knew of them they were in the possession of the receiver of the Amplex Company in November, 1914. I don't know who applied the circle with the capital letter A' in it to that print, I don't remember that.

(Witness shown a blueprint marked for identification as Plaintiffs' Exhibit 32.)

I recognize this blueprint. This is a print of the piston of the E. J. G. motor and as shown in Exhibit A'. This print was obtained from the Amplex Company, Mishawka, in 1914. There was two of these prints made and this particular print was used in connection with the other in promoting the company, in other words, in attempting to raise money to take over the Amplex plant. I don't know what became of the other one, but this one in particular is one I retained and it was in my possession until it was sent to the different places, one of the particular places particularly. I recognize this print as the particular print to which I referred, because it was always in my possession, and the explanation of how the piston operates is in my handwriting in the right-hand lower corner of the print. That descriptive matter was placed on the print right following that time at which I received it in July, 1914. After I received that particular print, Plaintiffs' Exhibit 32, Mr. Pulsifer had it, showed it to some of his prospects. Mr. Atkins had it and it was handled around considerably before it finally came to me.

The print finally came back to me shortly after the receivership. I received it from Mr. Pulsifer. It remained in my possession then until it was sent to the Buda Company, which was, I think, in the latter part of 1915, after July, sometime after July or August, 1915. I next saw that particular print, Exhibit 32, when it was returned to me from the Buda Company, either just before 1916 or just after the first of the year 1916. I know that because it was necessary for me to write to them two or three times in order to get it back. I don't know just when it came back, but they returned it to me, the Buda Company stamp is on this print and it will show when it was received by them, I can't remember the date, but it is on here. (Examining same) August 20, 1915, is the date when the Buda Company received this.

By Mr. Bruninga: I object to that as a conclusion.

The Witness: These Buda Company stamps were on the back of the print to which I have referred, when I received it back from the Buda Company. I believe this print was in Mr. Pond's possession for a very short time before it was returned to me, and I delivered it to Milton Tibbetts. Milton Tibbetts was connected with the Packard Motor Car Company. That was in the early part of 1916. These prints were delivered to Milton Tibbetts at his office. I went to Detroit for a conference in connection with these prints, and these patents that I was to turn over to them. While I was there I left these two prints of the piston, the one made in 1911 and this one under date of 6-24-14, with Mr. Tibbetts. I believe that was in March or thereabouts. There was a proposition made at that time or just prior to that time, to take over a number of the old patents, and these were to be included, if the deal could be put through by them, I mean if all of the other old patents could be secured. This proposition was made, I think, by Mr. Tibbetts—proposition made first by me, and then it was more or less mutilated until we finally came to an agreement as to what it was to be. I couldn't deliver all the patents that they wanted, so there was a change made in the price of the original offer.

(Witness handed Plaintiffs' Exhibit 52, comprising three sheets.)

These are a copy of a letter from Packard Motor Car Company by Tibbetts, which refers to the patent

which I was to turn over to them, the old patent, rather, and including the slide valve motor, with the piston, and also another motor, double-acting, air-cooled, and so forth. I received the original of this letter. I do not know where that original is now. I have looked for it.

Mr. McCoy: Plaintiffs' Exhibit 52 is offered in evidence, a letter from Packard Motor Car Company, by its patent counsel, addressed to Mr. E. J. Gulick, dated March 27, 1916, dictated as of March 25, 1916.

The Witness: After examining this letter, Exhibit 52, I find that paragraph 1 refers to the sleeve valve motor, the E.J.G. motor. I don't just remember what those exhibits were; they must be the ones you have there. The letter relates to a number of the old patents which the Packard Company were to purchase, also the slide valve motor patent and the piston patent, and double-acting air-cooled motor, also to special drawing of a drag link for steering gear; it refers also to the price to be paid for the assignment of these various items.

I can identify the blueprints marked A1, A2 and A3 from the records before me. A1 is a sectional view, Exhibit 31, of the sleeve valve motor; A2 is a right side view of the E.J.G. sleeve valve motor; and A3 would represent the left side, although the print is made from the wrong side of the tracing.

Under paragraph marked with the numeral 2, I have referred to a motor piston illustrated and described by a pencil drawing marked B1 and a two-page description marked B2, and I can identify those particular papers as Exhibits 36 and 37 here before me. The letter also refers to a blueprint marked B3, which is the blueprint of the piston in the E. J. G. motor. The particular blueprint referred to in this letter before me, is Plaintiffs' Exhibit 32. These are the same blueprints that are referred to throughout this letter and identified by me as blueprints marked A1, A2, A3 and B3.

(Witness handed several sheets of correspondence marked Plaintiffs' Exhibits 53, 54, 55 and 56.)

This is correspondence with the Packard Motor Car Company relative to the patent transaction, sales. I do not know where the original is of Plaintiffs' Exhibit 55. I received the original letter. I searched for the original letter but did not find it.

By Mr. McCoy: I offer in evidence Gulick Exhibit 53, which is a letter addressed to the Packard Motor Car Company and signed by E. J. Gulick, dated April 1, 1916; Plaintiffs' Exhibit 54, a letter from E. J. Gulick addressed to the Packard Motor Car Company, dated December 4, 1916; an original carbon of a letter from patent counsel, Packard Motor Car Company, addressed to E. J. Gulick, dated February 28, 1917, as Plaintiffs' Exhibit 55; and a letter addressed to Mr. Milton S. Tibbetts, counsel, care of Packard Motor Car Company, from E. J. Gulick, dated May 18, 1917, Plaintiffs' Exhibit 56.

(Thereupon, at 5 P. M., on Saturday afternoon, Mr. Richey stated as follows:)

By Mr. Richey: It has been suggested, I believe everybody including the witness agrees, it is wise to adjourn now to March 14th and bring him back, or whenever the next session is to begin, to bring him back and complete his testimony then.

By Mr. Brumnga: I would like to make one statement before we go. Counsel has persistently refused to state their position with reference to these Gulick Exhibits 48, 49 and 51. I believe in that case it is not too much for me to ask that before I be required to put Mr. Schoengarth on with regard to that piston which I referred to, that counsel should state their position with reference to whether that is in the scope of the Gulick patent. There has been a peculiar situation established, that, in the first place CCC, I can't see where that distinguishes from the Schoengarth, and in the second place, if those particular Exhibits 48, 49 and 51 are within the Gulick patent, then Schoengarth is very pertinent; if they are not within the scope of the patent, and this thing develops on a flexible rib, it might be useless to call Mr. Schoengarth.

By Mr. Richey: We will state our position at the proper time. We have no desire to argue the case at this time.

The Master: The suggestion will be noted at this time and your request, and you can state your position at the further hearing, as to these exhibits referred to.

(Thereupon, adjournment was taken to March 14, 1933.)

(Thereupon at 2:00 o'clock P. M., Tuesday, March 14, 1933, the hearing was resumed.)

(Appearances: Messrs. F. O. Richey and Wm. C. McCoy, for plaintiffs; and John H. Bruninga, Esq., for defendants.)

By Mr. Richey: I have a statement to make about those claims.

Pursuant to an agreement made by counsel at pages 193 to 195, inclusive, of the record, counsel for the plaintiffs announce that they charge that the piston Exhibit 3-J infringes the following claims of the Gulick patent: 1, 4, 15, 25, 28, 33, 36, 42, and 43.

Is counsel for defendants willing that the piston Exhibit 3-O should be included in the case under the same stipulation as CCC and 3-J, occurring at pages 193 and 194 of the record, and the same agreements as are set forth at pages 193 and 195 of the record?

By Mr. Bruninga: Yes; but I want to look into the record to see whether it will be perhaps necessary to put in some testimony with reference to this exhibit.

The Master: I think counsel is entitled to have the chance to examine with reference to that.

(Thereupon discussion had as to whether defendants had rested, and matter held in abeyance.)

Edward J. Gulick thereupon resumed the stand for further direct examination.

Direct Examination by Mr. McCoy.

(Witness handed letter dated March 26, 1917 from E. J. Gulick to Packard Motor Car Company, Mr. Tibbetts, counsel.)

This letter refers to a number of early patents that I was taking over from the receiver of the Amplex Company to be transferred to the Packard Motor Car Company. This letter relates to the same general transaction between myself and the Packard Motor Car Company that is dealt with in the letters, Plaintiffs' Exhibits 52, 53, 54, 55 and 56, inclusive, heretofore identified by me. This letter is a reference to all the correspondence and all the patents in question.

The statements of fact made in these letters, Plaintiffs' Exhibits 52 to 57, inclusive, are true and correct.

By Mr. McCoy: The letter identified by the witness, Plaintiffs' Exhibit 57, is introduced in evidence.

During the time that I was connected with the Excelsior & Manufacturing Company in 1911, that company acquired some of their piston castings in Chicago and some in Cleveland, and some of them were made by the Manufacturers Foundry Company of, I believe, Bridgeport, or East somewhere in that neighborhood.

The Excelsior Motor & Manufacturing Company had core-boxes and patterns for the manufacture of those castings. The patterns were the standard piston box patterns or piston body patterns, and the core-boxes standard piston core boxes of metal, the same general type. I recognize the core box 58 as the standard Excelsior core box, and 59 the standard Excelsior piston pattern. These were the character of core boxes and patterns used to produce pistons like Plaintiffs' Exhibit 47 at the time that I was connected with the Excelsior Motor Company.

Mr. McCoy: The core-box and pattern identified by the witness Plaintiff's Exhibits 58 and 59, are each offered in evidence.

The Witness: The automobiles in which the split skirt pistons were installed under my supervision and direction while I was connected with the Excelsior Motor & Manufacturing Company in 1911, were experimental cars built by the Excelsior Company; two of them only were ever built; they were of the Renault type. By that I mean that the radiators were of the Renault type, at the rear of the motor. All other parts of the car were standard parts picked up from different concerns. The motor was the standard Excelsior motor. Incorporated in a standard Excelsior motor there were also a number of minor changes for different manufacturers, such as water manifold, or slight changes in pump, or something of that nature. Such motors were commonly called by the manufacturer's name, although they were standard Excelsior motors.

The particular automobile in which the engine having the split skirt piston was placed under supervision and direction in 1911, was one of these two cars of the Renault type.

By Mr. McCoy: Opposing counsel admit that the original of the photograph which will now be submitted to the witness for examination is lost and that the letter dated December 1, 1927 from Webb & Bocorselski-Norris Peters to The Gates Legal Publishing Company of Cleveland, Ohio, explains the loss of this photograph.

(Witness handed a picture of a car.) (Exhibit 60.)

The photo Exhibit 60 is of the same car in which the split skirt pistons were installed by me in 1911. The original of that photograph was made by, I believe,—the original was taken by a man by the name of Williamson —Williams,—I said "Williamson." Williamson and his wife, my wife and myself, made a trip to Mishawaka about the 1st of October, 1911. This photograph was taken somewhere near Michigan City, either on the return trip or the trip going down; I don't remember which.

I remember what character of pistons were used in that car at the time the photograph was taken. They were standard Excelsior pistons, split across the top and cut down the skirt. That is, pistons of the character of Plaintiffs' Exhibit 48, concerning which I have previously testified. As to the manner in which those pistons were fitted to the motor of that car, the skirt was a very close fit. The head portion, however, was ground to a standard clearance only. The skirt portion being slightly oversize of the standard grind. By "standard clearance for the head portion," I mean that Excelsior pistons were given the standard clearance of about seven thousandths of an inch throughout the length of the head and down and including the bottom ring, including the bottom ring, and the skirt was normally given about 1½ to 2, and sometimes as high as three thousandths. In these split pistons, however, the head clearance was not changed in any form from the standard form of the Excelsior piston, but the skirt was increased in diameter to make it a very close fit to the bore. The head portion of the piston, Exhibit 48, is the portion that carries the ring down to the slot, down to the skirt.

With respect to Exhibit 48, the relief of the head portion extended to the slot, overlapping the slot. With respect to the entire circumference of the piston, the relief extended completely around the piston.

With respect to the fitting of the wrist pin in those pistons, they were a very close fit; about as close as they

could be made; and driven in lightly; but in these particular pistons they were held in with one set screw in them, the object of the set screw being merely to prevent the pin from moving endwise in the piston. The set screw was located in one of the bosses.

The pistons that were installed in the motor that was placed on the test block and tested out on the test block at the Excelsior Motor Company were fitted in the cylinders the same as in the test motor, the same as in the motor in the test car.

The general conditions of fitting the wrist pins in the pistons that were installed in the motor that was given a block test at the Excelsior Company, were the same as in the Excelsior motor. There were two styles, however, of connecting rods used in the Excelsior motor: one with the clamp rod on the piston pin, and one with the rocking rod on the piston pin. I don't recall which one of those rods were in the Excelsior Motor that was tested. Were it the rocking rod, there would be no set screw in the piston. If it were the swinging rod, why, there would be one set screw in the piston.

The two-cylinder motor to which I referred was a two-cylinder V, four cycle motor. Those motors were first used by the police department of Chicago, and also for racing purposes at the Motordrome. They were motorcycle motors.

My prior testimony regarding the last few questions has referred to the tests made on the motorcycle motor and not the tests made on the block on the motor that was not later assembled in an automobile chassis.

The pistons in the Excelsior motor that was tested on the block and not later assembled in an automobile, were equipped with wrist pins the same as they were in the motor in the automobile.

Again referring to the pistons, the split skirt pistons that were tested in the motorcycle engine, with particular reference to the fitting of the pistons with respect to the cylinder wall, the head clearance on the m orcycle piston was not changed; the skirt, however, was enlarged. The clearance of the head would be substantially a standard clearance whereas the skirt clearance would be very small relative to the cylinder wall.

With respect to the use of the split skirt piston in the Renault type of car, the motorcycle pistons were tested in the early part of the summer of 1911, prior to the opening of the Chicago Motordrome, which I believe

was in about July, about the 4th of July, somewhere thereabouts.

Q. Did you examine the split skirt pistons taken from the Renault car after their removal from the engine? A. Yes.

Q. When was this? A. It was just prior to the sale of the Excelsior Motor Company in November, 1911.

Q. What did you find with respect to the condition of these pistons? A. Found nothing wrong with them; they weren't scored, and were in perfect working condition.

Q. Why did you remove those pistons from the car at that time? A. We had orders from the creditors' committee to dispose of both cars and all Excelsior motors. These cars couldn't be sold with experimental pistons in them; for that reason they were removed and standard pistons replaced and the cars sold.

Q. Were all these pistons in that condition when you removed them finally at the time of the receivership, in 1911? A. Yes.

Q. Were any of the pistons taken from that Renault type of car broken in any way at the time the pistons were removed? A. No.

Q. Did you examine those pistons at any time prior to their final removal from the Renault car? A. Yes.

Q. What was the occasion for that? A. One of the pistons was broken; defective one removed and a new one installed.

Q. What was the condition of the remaining pistons at that time? A. Perfect.

(Narrative continued) After the pistons were taken from the Renault car, after their final removal, they were scrapped. The pistons taken from the automobile motor which was subjected to block tests were also scrapped after their removal from the motor. The pistons from the motorcycle engine were scrapped after they were removed.

At the time of removal of the motorcycle pistons one of them was perfect, and one was bursted at the pin hole.

By Mr. McCoy: The photograph identified by the witness as a picture of the Renault type of car driven by him in 1911 is introduced in evidence as Plaintiffs' Exhibit 60. And the letter accounting for the loss of the original of the photograph, is introduced in evidence as Plaintiffs' Exhibit 61.

The Witness: Again referring to the sketch and descriptive matter, Plaintiffs' Exhibits 36 and 37, these were kept together by me at the time they were in my possession. These sketches were made on a very inferior grade of bond paper. This paper came from the Amplex Motor Car Company, Mishawaka. When I left there in 1910 I took some of that with me to Chicago; it was used only for sketching purposes.

At the time this sketch and descriptive matter of Plaintiffs' Exhibits 36 and 37 were made, I showed it to my wife in order to give her an idea of what it was all about, so that in case anything should happen to me, she would be able to protect herself, perhaps make some use of it. She was something of an automobile driver and understood fairly well the meaning of such things. As there were only two of us, our interests were mutual. A great deal of my work in this respect and in other respects was done at home, and she was familiar with practically all of the sketches and drawings which I made. I explained completely to her at that time the structure of the piston shown and described in Exhibits 36 and 37. She indicated that she understood it. I explained to her at that time the operation of the piston shown in Exhibits 36 and 37, and she indicated that she understood its operation. I believed that she did understand the structure and operation of the piston because in her conversations she seemed to understand thoroughly what I was talking about.

By Mr. Bruninga: May I interpose a question at this point? So the master will be familiar with the situation? Mrs. Gulick is dead. I therefore interpose an objection.

By Mr. Richey: I think it is competent to show a disclosure.

By Mr. Bruninga: It is not at all competent in this case. The only purpose could be to have somebody corroborate him, and the corroborating party is dead. And I object particularly as to what she might have understood.

By Mr. McCoy: I think it has already been brought out that Mrs. Gulick is dead. We are offering this evidence to show a disclosure of the subject-matter of this invention to Mr. Gulick's wife at the time these sketches were made.

The Master: I think I will overrule your objection and you may have your exception.

(Short recess taken.)

The Witness: I recall showing this sketch and descriptive matter to a man by the name of Grubb, Frederick Grubb, at the time these papers were prepared in 1911. He is now dead.

By Mr. Bruninga: Same objection.

The Master: Same ruling.

(Narrative continued) As to the relation between Mr. Offield and Mr. Pond, the patent lawyers in Chicago to whom I turned over Plaintiffs' Exhibits 36 and 37, these papers were turned over to Mr. James Offield, Jr. in the latter part of 1911 or around about the first of 1912. Mr. Offield was connected with the Offield, Toll, Graves & Offield Company. Later on he separated from the old company and went by himself. After a number of months I was unable to get any satisfactory answer from him as to what was being done, and later I ordered the papers turned over to Pond. Pond at that time was connected with Offield, Toll, Graves & Offield. Some time later, Pond's connections were severed with Offield, Toll, Graves & Offield, and it became the firm of Pond & Wilson. These papers were then in Pond's possession and were in his possession until the latter part of 1913, or about the first of 1914, when they were turned back to me for the purpose of designing the EJG motor in 1914. Some time later in 1914, the latter part or the early part of '15, they were again returned to Pond, and were in his possession up to or just prior to the time of the sale of the various other patents to the Packard Motor Car Company. Pond returned them to me and I delivered them to the Packard Motor Car Company in the early part of, I believe in the early part of 1916.

Q. Now, referring to the split skirt aluminum pistons that you have heretofore testified were installed in a Buda motor at the Amplex Company in 1914, did you examine these pistons after they were placed in that motor at any time? A. No, not until they were finally taken out.

Q. What did you find to be the condition of those pistons at the time they were removed? A. The pistons were in perfect condition, with the exception of the piston pin bosses, which were not pounded out, but they were freer than they should have been where the piston pin fits into the bosses.

Q. Where were the pistons at the time you examined them? A. In the erecting room of the Amplex Motor Car Company.

By Mr. McCoy: The various exhibits heretofore identified by this witness are offered in evidence on behalf of plaintiffs under the numbers by which they were identified. I think several of those have been offered in evidence. In the event I have missed any, I am now offering them in evidence.

By Mr. Bruninga: Any objection to those offered in evidence and identified I would like to have stand as against the offer.

The Master: They may be received, with the same reservation.

By Mr. McCoy: Direct examination closed.

Cross Examination by Mr. Bruninga.

I had three sets of pistons made, corresponding generally to Exhibit 48, which I tested about May, 1911. The first test was the motor block test on the motorcycle piston. The motorcycle pistons were never tested in a motorcycle; it was tested on the block, on the motorcycle block. The first set was a small motorcycle piston about 2-9/16" in diameter. That is the diameter of Exhibit 49. That was slit in the same way as Exhibit 48. Both the circumferential slot and the inclined slot were about the same. That motorcycle piston had these ribs on the inside extending circumferentially from the wrist pin bosses as in Exhibit 49, and the inclined slot was in the region between the wrist pin bosses. That inclined slot did not necessarily cross any of the circumferential ribs going from the wrist pin bosses.

I found that piston with the circumferentially extending ribs from the wrist pin bosses to be fairly flexible, I don't think the circumferential ribs had effect enough on the flexibility to interfere with it. I actually found that to be a fact. The fact that the pistons refused to seize, and that you could close them with your hands a couple of thousandths, was proof enough to determine that fact.

Taking a piston like Exhibit 49, with a slot circumferentially around the piston, and just below the ring land, and with a diagonal slot, you can't close the slot up the full width of the slot, but you can close it a thousandth or better. You can close the whole thing so it won't seize. I actually did that with my hands. You can take a construction like Exhibit 48 and close it with your hands enough so that it won't seize. There is a

long free end at the top in Exhibit 48 which helps the structure in closing sufficiently to prevent its freezing. It wouldn't be necessary to close the short part or move that very much. That is why he slit the cut diagonally, to allow the two overlapping points to close one over the other. I could very readily close the slot at the bottom. That would not be true irrespective of whether I had the circumferential slot. You have to have the circumferential slot around here in order to make this portion close in. The bottom would close about as well if you simply had the inclined slot, but the top would not.

The head of the piston was relieved the standard clearance. The standard clearance was given to the head down over the rings and onto the slot, overlapping the slot, all the way around, whatever your wheel would grind, down to that; that is what the clearance would be. I can't say as to whether the piston, Exhibit 48, was made that way or not. That piston when those slots were cut, wasn't ground to anything standard, not that I know of. I ground the one I had the standard clearance from the head down to the slot, and the skirt was ground over the standard size, but no change in the head. I never relieved the region of the skirt or wrist pin bosses on either side; not any different than that you see there; that is the standard make-up.

Going back to the first standard motorcycle piston, that was made in the neighborhood of May 1911. It was before the Motordrome opened in July. That was the cast iron piston. I gave that a thorough trial. I can't say how many hours, total hours, that piston was tested on the block, but I know it was on the block from one afternoon until the next night; the motors were run all night.

I don't remember what the clearance of the skirt was. It was larger than the standard skirt. It was a very close fit; it was larger than the standard fit; just as close as could be gotten in the cylinders and pushed through with the hand and not fall through. It was a very close clearance; but the head clearance was just the standard clearance. I ran the motorcycle engine with wide-open throttle, and on the dynamometer. It was a good hard test for the piston as light as it was constructed.

Q. You were thoroughly satisfied with it? A. Thoroughly satisfied. If the construction of the piston had been developed for that particular work, that was a

chance to find out what would happen, whether the piston would seize or whether it would not. That was the principal object of that test; it wasn't to put that particular piston into practical use, because it wasn't designed for that particular purpose; but to find out the result of the slot, whether it would seize or not.

Q. But the test was sufficient to satisfy you as to the practicability of that method of slotting? A. Absolutely.

Later I started to have a set of cast iron pistons made for that Renault car. That was around July of the year 1911. I took the standard Excelsior piston casting and slotted it in the method that is illustrated by Exhibit 48, but it was not ground the same as the standard. It was slotted the same as 48; the grinding was not the standard grinding. The head was standard grinding. The skirt was over-sized. That skirt had a good snug fit, very much closer than the ordinary cast iron fitting which I used before that date.

That piston didn't have any relief in the region of the wrist pin bosses, up and down; I didn't need it.

Q. That was, again, a cast iron piston? A. Standard Excelsior cast iron piston.

Q. Now, how many were in that car, four or six? A. You are referring to this photograph?

Q. The Renault car? A. Four. What do you mean—cylinders, people, or what?

Q. No, how many cylinders? A. Four.

Q. Now, you operated that car for some time, did you? A. Yes.

I ran the car practically all the time myself. I made it my own use; it was a factory car. I used the car to drive back and forth from my residence to the factory, and Sundays and Saturday evenings for pleasure and whatever else I wanted to use it for. I was factory manager for the company at that time. I didn't use the car very much to haul anything other than human beings. We might have hauled a load in it once in a while, you can't tell. I used it regularly in business, and for pleasure purposes, too. I used it, the same as if it was my own car. It was also used the same as if it was a company car. The car belonged to the company. I found the pistons worked to perfect satisfaction.

Q. How long before you found out it worked to perfect satisfaction? A. Well, the car was driven the first time in July and it was about October when I was

on the trip to Mishawaka, the first trouble came up with one of the pistons. That was the first indication of any trouble.

Q. Do you know what caused that trouble? A. I don't know what caused it.

Q. Well, that happens in pistons, even standard pistons, isn't that right? A. Yes.

Q. But you were perfectly well satisfied even before you made the Excelsior pistons for the Renault car that the previous test of the motorcycle piston was satisfactory, isn't that right? A. I knew they were satisfactory.

Q. You then drove that Renault car 3,000 miles? A. I wouldn't say whether it was 3,000 or 4,000 or 2,500; it was driven a lot of miles, I don't remember just how many.

Q. But at least a month? A. It was driven longer than a month. It was driven from July to just prior to the 1st of November.

Q. And used just the same as any other car? A. The same as any other car.

Q. And you hadn't looked the pistons over in a week or so to see how they worked? A. No, because there was no trouble with the pistons until about the 1st of October, that is when one went bad. They were all taken out then. There was no indication of scoring on any of them; they were all perfect with the exception of the one that had a fracture in the boss.

Q. That was simply a mechanical defect due to the casting? A. That was broke, all there was to it; that was replaced. There was no more trouble until removed from the car.

Q. You say about the 1st of October? A. About the 1st of October, as near as I can recollect.

Q. The car had been run from July, August, September? A. Yes.

Q. You run it from October until—? A. Until the latter part of November.

Q. And you then took the pistons and threw them away? A. They were scrapped.

Q. Who scrapped them? A. I don't know who put them into scrap. I saw them. I examined the pistons when they were taken out of the car. They were taken, and in our test room we always had scrap, a lot of things that were throwed in the scrap pile, and there they were left.

Q. You saw them being thrown there? A. I looked them over before they were put there, and saw them thrown there, that is all there was to it.

Q. Now, coming next to that piston that you used in the Amplex Buda motor car, of which you have the sketch Exhibit 51. Do you consider there is much difference between Exhibit 51 and Exhibit 48, so far as principle of operation is concerned? A. Yes, some difference.

Q. What is the principal difference?

By Mr. Richey: I object to this testimony asking the witness for his conclusion. He has been put on as a fact witness. He can ask him how the pistons operated.

The Master: Oh, I think he may answer. You may have your exception.

By Mr. Richey: I point out he makes the witness his own when he is asking for his opinion.

The Master: He may answer and you may have your exception.

The Witness: The difference between 51 and 48 is that the slot in 51 extends completely around below the head, and that 51 has double ribs extending from the head to the piston pin bosses. The fact this slot, which is cut completely around, affords a degree of greater flexibility than could be obtained in 48. Also if 51 were made up of aluminum, more strength would necessarily be required than there would be in the design of 48. The flexibility of the piston, Exhibit 51, is affected by the fact that the slot around the piston also runs past those ribs. It is more flexible in every direction. That slot should be shown in the top middle figure; it should have been dotted across there. The slot is shown here in course, passing by, going through, at 6-6. That slot shows here (indicating), but I omitted to put it in there. That is merely an error in the sketch. Both pistons, Exhibits 51 and 48, embody the feature of having the circumferential slot and having the vertical slot. I consider Exhibit 51 a further development of the principle of Exhibit 48. I actually tried that Exhibit 51 piston out in the Amplex car. I did not give it a previous block test. We didn't have any block test.

Q. You were perfectly satisfied from the performance of the motorcycle piston and the piston like Exhibit 48, the Renault piston, it would work? A. I was perfectly satisfied with the result.

Q. So you just put it right in the car and drove it around 4500 miles? A. Yes.

Q. And it never even occurred to you to look at the pistons to see whether they scored before you took them out? A. Never had any trouble with them at all, and they never did score.

(Narrative continued) That car was used pretty hard. It was driven a lot of miles. I don't remember how many, but it was driven every day and every Saturday and every Sunday over the week-end, sometimes three or four hundred miles over the week-ends, and it was driven at all speeds as fast as it could be; lots of times full power of the motor. It never was favored in any form. That is why they were put in, to find out what they would do.

Q. And you were perfectly satisfied right from the start? A. Right from the start they never gave a particle or a sign of trouble.

(Narrative continued) I ran the car with those pistons in it up to the 12th or the 11th of November. No, it was taken out prior to the 11th of November. The 11th of November I saw them. No, they were driven from July until about the middle of November, or a little later, when I went east, and I instructed the force to take the pistons out of the motor and put back in the Buda pistons, as I had a sale for the car. I came back on the 11th of November, and when I came back the car was in the garage down by the Mishawaka Hotel waiting for me. I drove it to the factory. That was the day of the receivership, 4:00 o'clock in the afternoon; 4:00 o'clock in the afternoon when I arrived there, to be exact, and the sale was over, the factory was gone. And we had some castings for this E. J. G. motor, they had come in while I was away, and the new receiver and the bondholders practically gave me to understand if we could straighten the matter out he was willing to assign them back to us. So he didn't prevent me from going back to look in the factory at the new E. J. G. motor, and that is when I had the chance to examine these aluminum pistons; they were in perfect condition, and that is the last time I saw them.

Q. What did you do with them? A. They were set aside, I suppose they went into the scrap when the receiver—

Q. In other words you threw them away? A. I didn't intend to throw them away, but they got away, I

didn't have any chance to get them after that. I never was in the factory after that day.

Q. Why didn't you go in the factory after that day to get your pistons? A. I was out busy trying to raise some money to get that factory back into my possession. We didn't figure we were going to lose it, but we did.

Q. When did you find out the pistons were gone? A. I didn't find out the pistons were out of the factory until spring.

Q. How long? A. Until the early part of the season, until we finally found out we couldn't raise the money, then I tried to buy back the castings for the E. J. G. Motor, and the whole business, so we could start anew, and I found out the scrap had been sold, everything had been sold.

(Narrative continued) I didn't have any contract whatever with either the Excelsior or the Amplex Company that I would turn over my inventions to the company. The pistons in the Excelsior Company didn't belong to the Excelsior Company, they belonged to me personally because I paid for the work that was done on them, but because I had no right under the receivership, was instructed to do no experimental work on the company's time, I bought these pistons and tested them out to my own satisfaction, because I knew later on I was coming back to Mishawaka. That is why I did that, test out the pistons. I mean Exhibit 51, that was put in the Amplex car in '14; that was my personal property. Those pistons were paid for long before they ever went into the car. The car was my property four weeks before I received the bill of sale, and the reason I didn't receive it was because the car wasn't complete then, and the bill of sale was made out when the car was not complete, so the net result was I didn't take the bill of sale until the top was put on the car, and when the top was put on the car and the bill of sale was made out that was the day the aluminum pistons were finally installed.

Q. So you went back the following spring, in 1915, to see where the pistons were? A. No, I didn't. I didn't go back to the factory to see where they were. My statement was in the following spring we were unable to raise the money, Kamms then were running the factory, and they refused to let us have the factory, when we had enough money to raise the bond; so I was turned out. I was never in the factory after that, and I was told by the employees that all the pistons and everything per-

taining to the work was scrapped; they were put to one side.

(Narrative continued) I didn't take the pistons out of the car; they were taken out while I was in the east and the original Buda pistons reinstalled so that the car could be sold as a standard motor, with a standard motor in it. There wouldn't anybody want those pistons in, because he wouldn't know but in six months or so he would want to replace one and he wouldn't know how to get it. You wouldn't want to go out and buy a car with a set of experimental pistons, and if you broke one of them you had something you couldn't replace, and you would be up against it. That was the reason they were taken out. I wouldn't sell anything to anybody like that. That was a Buda motor, and if he had one taken out he could put one back.

I did not have the pistons taken out because I was afraid they would break. I didn't want to sell the car with a set of pistons that weren't standard and he couldn't replace. I had a sale for the car and that is why I ordered them out. If I had kept the car myself I wouldn't have taken them out.

I had the original pistons put back in on account of the sale, and for no other reason whatever. I didn't want to leave the pistons in, because he couldn't replace them, where he would want to get them maybe several months or a year after; where could he get a set made?

Q. He could buy a set of Buda pistons?

The Witness: Yes, he could, but there is no logic in that, as far as I am concerned.

That is the reason I took them out, so I could give the man his money's worth. I intended to keep the pistons. I didn't want them to get away from me and let them get out in the car, something that wasn't standard, that would be a very foolish thing for a man to do.

I got through with the Amplex Company when they went into the hands of a receiver in November. I never was in their factory after that day. My car was never in the factory after that day. The car was sold shortly after the first of the year, or before the first of the year, shortly after the first of the year the car was sold; I never saw the car after that, and never rode in it; it was sold to a banker in Elkhart.

I used that car from April to November, 1914 for my own business, for company business; it was my own

personal car; it was paid for long before I got it. I used it for going on trips, even on short trips around town or company business, or my own business, everywhere. I used it in business; I donated it in business, you might say, I donated it. I used it for business and pleasure. I donated it for business.

The company I am working for today don't pay for my car, and I don't charge them for running it on company business.

I haven't got that particular Amplex car with those pistons in it. I did use it in 1914, on company business and my own business. I don't know what the mileage was, I don't remember now.

Q. You figured it out from the record, you had the bill of sale, and from the notations on it, that the difference between what the speedometer read when you got it and the speedometer read when you sold it, checking off about 300 miles for good measure, was around 4500 miles. A. If that is the way it figured out, that would be it.

(Narrative continued) As to who saw the first pistons I put in the motorcycle and those split pistons, slotted like Exhibit 48, that is the cast iron piston on the desk, I don't remember the superintendent's name of the motorcycle department, piston department—the name was Lundin, John Lundin.

I don't remember who the fellows were that were running the test. I didn't try to hide it from anybody.

Coming next to the pistons like Exhibit 48 in the Renault car, I imagine quite a lot of people saw them; they couldn't very well help it. I am sure a man by the name of Johnson and a man by the name of Engle saw it. Johnson was foreman of the tool room. Johnson was the man who had instructions to cut the slots. Beard was the man who had instructions from the piston department to do the grinding, grinding them oversize to close fit. Beers was the one who did the grinding in the piston department.

There might have been a lot of the fellows in the shop who saw it because he couldn't very well grind them in the piston department without others seeing them, and they might not have known what they were. 15 or 20 men in the tool room when Johnson was cutting the slot, probably saw the slot and wanted to know what it was. The place wasn't roped off. Lots of the employees could have seen it, of course.

When it was put in the car it wasn't kept secret. The man who put it in the car, helped put them in, did this—this slot, that wasn't done in the tool room. I mean the vertical slot. This angular slot; that was sawed in; the man that put them in the car sawed that slot in there.

I don't think Harvey Williamson ever saw the piston. I know he didn't see the piston because he couldn't have seen it. I don't know of anybody outside of the company that I can recall the name of, saw it. But there is no question but what employees in the shop saw it because it couldn't have been kept under cover because it was too much open. Very likely whoever collected the scrap saw it and wanted to know what it was all about. He might have—I don't know, I didn't see the scrap sold.

When I got the pistons like Exhibit 51 that was used between July and November, 1914, in the Amplex car, aluminum pistons, I don't know that a lot of people saw that piston; but I know a man by the name of Rockhoff saw them. He made the castings in the Rockhoff Foundry. I know a man by the name of Johnson saw them, not the Johnson I spoke of before, but another Johnson of the Amplex Company, tool room foreman, a man by the name of Hoadley saw them. A man by the name of—well, I don't know who did see them. There was at least a dozen around there that saw them. Hoadley was the man, as I recall it, that put them in the car. He had a helper; who the helper was I don't know. Just what I say now, I would say probably 10 people, maybe more, saw them. I wouldn't limit that to employees of the Amplex. I don't know who all saw it. There might have been others in the factory, come in at the time. The factory wasn't closed up, but open, and there wasn't much going on, and there might have been other people, people in the office saw it. Some of the boys in the drafting room saw it, and the boys out in the shop saw it. They had all had a whack at it. There wasn't more than 20 or 25 people, employees, there, all told.

I think a man, outside of the Amplex Company, by the name of Atkins, saw the piston. He was selling stock for us. He might not have seen it but I was under the impression he might of because he drove the car himself considerable.

It was all open and above board; anybody could see it that wanted to. We had nothing to put under cover on it.

Q. And you never had the Renault or Amplex car pulled down to take out the pistons except that one you said was broken in the region of the boss? A. That was on the Renault, that was the only one that was taken down.

(Narrative continued) It was taken down by a man by the name of Engle, an employee of the Excelsior Company.

From the previous motorcycle experience, I was perfectly satisfied that the pistons would work, that the theory was right, the idea was correct, even before those pistons were put in that Excelsior car. That was also true before I put the pistons like Exhibit 51 in the Amplex car.

The Renault car, with the pistons in it like Exhibit 48, was run from July to November, whatever the mileage was, and then they were scrapped.

The pistons like Exhibit 51 were used from July to November, 1914, for a distance of about 4500 miles, and then taken out and eventually were lost.

Apparently the cast iron pistons were sold for scrap; they could not have went anywhere else. I think the aluminum pistons were also sold for scrap.

Q. I would like to clear up one point with reference to the aluminum pistons. Did you make a thorough search for them to see if you could find them? A. No, I never saw them, never was in the factory from the 11th day of November, 1914; that is the last time I saw them.

(Narrative continued) Some of the employees in the factory told me they were gone, I don't recall who. I think Randall. I think Randall said that they were there for a few months after the new receiver took it, for a period of time, and when the Kamms took the factory over they sold all the automobile parts, sold all the scrap, aluminum and everything, wiped it all off the map; they never built another car, never even attempted to, and everything went into the scrap pile, and they realized whatever they could. They intended to run the company, but they didn't; they run for a few months and then sold it to the Jewett people.

I made inquiry about the E.J.G. motor, if they still had the castings there. I wanted to buy them and finish the job. And he said no, it had been scrapped, everything that went with it. I asked them if the pistons were there yet and they said no, everything had been scrapped, there wasn't anything.

Q. You asked him particularly about the type 51 piston? A. Yes, I did.

Q. The reason why I asked you, is whether you referred to them or to the particular pistons of your application drawings of which you had castings made. A. I am talking about 51.

(Narrative continued) I made this inquiry long after, it was in 1915, in the early part of 1915. It was when Kamm turned us down and wouldn't accept our money. I made inquiry of what had become of all of this stuff that we was carrying through.

These pistons were part of the experimental work; that was why they were put in the Ampler car, that was one of our purposes because in testing a new motor we intended eventually to use aluminum pistons, but we weren't sure of how far aluminum pistons would go in the industry, or nobody else knew, I think you are aware of that, it was an early jump into the game, no one knew how the pistons would work. We knew they wouldn't work solid, if they were fitted close the material was against it, but if it moved out, if they were slotted and split, they would work, and work satisfactorily, and that was proven down there. That was the first set of aluminum pistons I tried out, and they did work. If we ever completed the new motor, the aluminum pistons would have been in the other motor of the other type.

In 1915 I found out everything had been scrapped in relation to that motor, in relation to that test stuff, everything in the factory, I was told; I don't know what the details were. It was the early part of 1915 when we were turned down on the sale, on the taking up of the bonds. That must have been along about May or April, the early part of 1915, or right around in the neighborhood, when they finally turned us down flat, that is when I made inquiry, because we were still figuring on going on and getting hold of these castings and stuff and getting hold of it and taking it to Elkhart and starting a factory there; but our plans fell through.

The man who informed me of the fact those pistons had been scrapped didn't tell me what junk man got them. I don't suppose he knew any more about it than I did. I didn't ask him about it. I simply made the inquiry, and the answer I got was everything had been scrapped. Everything was gone so that was the end of it, so I didn't look any further. I was not so particularly interested

in getting the pistons back because I had the aluminum pistons already designed to go ahead with it, but I would like to have got them back.

Q. But you made no efforts? A. I couldn't make any efforts. My impression was they went into the foundry across the road and was melted up.

Q. And you haven't made any pistons of either the motorcycle type or the Renault car type or the Amplex type since that time, have you? A. I slotted one piston of that type since then; about 1926, I would say, just prior to the taking of the original interference. That is the piston right there (indicating Exhibit 48). I was asked to do that for the purpose of that interference proceeding; that is the only one I touched at that time.

(Thereupon, adjournment was taken to the following day at 9:30 A. M.)

(At 9:30 A. M., Wednesday, March 15, 1933, the hearing was resumed.)

Further Cross Examination by Mr. Bruninga.

My conception in 1908 was on the order of Exhibit 51, the one with the slot clear around the top. I had a definite idea in mind in 1908. It was a piston in which the slot ran all the way around the top, and it had a slot somewhere between the wrist pin bosses.

I made some drawings or sketches in 1908, and took the matter up with the engineering department of Amplex, but it was found to be impractical in a two-cycle motor. I can't name any particular one I took the matter up with. It was given consideration, though, by the department. I know it was given consideration by the department because I talked to different ones in the department about it and in the experimental room.

I never made any pistons like that until 1911. I never made one that was slotted clear around the top until 1914.

From about the year 1908 to 1911 nothing was done with the pistons of those types. The sketch of the piston was made in January, 1911, but the piston was not made until later.

The 1911 sketch was very similar, well, it is the sketch indicated in Exhibits 36 and 37. That particular sketch was made in January, 1911. I am positive of that.

Q. So from 1908 to January, 1911, you really did nothing about it? A. No, I didn't make any more sketches.

Q. Did you file any application for patent for inventions during that period? A. Not on the piston.

Q. Not on the piston, but you did on a number of other things? A. Yes.

Q. Do you remember about how many—I don't want to find out what they were,—if there were some, or just how many? A. No, I don't know how many, but quite a number.

Q. Quite a number between 1908 and 1911? A. Yes.

Q. And you weren't financially embarrassed during that period? A. Well, I wasn't financially flush, either.

The company paid for the applications. That was true of the rear axle construction on which we were in litigation with Packard. The company paid for that, the Amplex Company. I had a contract with the Amplex Company whereby they would pay for the patents, and in case of insolvency it would revert to me. They paid for all the patents, for the use of them.

My suit against the Packard Company was by me personally, because I owned the patents, had bought them back, and paid for them in cash either in the latter part of 1912 or the first part of 1913. I bought it from the manager of the Amplex, William Meade, paid him $1400.00 in cash for it in Chicago and brought suit against the Packard Company. That was either in 1912 or the first part of 1913.

During the period of 1908 to 1911 I wasn't so financially embarrassed but what I could have made application for patent on this split piston, like Exhibit 51.

In a general sort of way, as far as the idea of splitting the skirt was concerned, the idea wasn't any further advanced in January 1911. I had my idea all built up as to what I wanted to do with it, and how I wanted to do it. But as to the real finally developed design, that had not been carried out.

There is a difference between Exhibit 51 and 36, as far as principle of operation is concerned. 51 is a later development. 36 was of course a developed job for the purpose. That had ribs in it extending from the head down to the bosses. The bosses do not join with the skirt. The webs extend outwardly from the wrist pin bosses to the skirt, in Exhibit 36. There is nothing like that in

Exhibit 51. 51 was later, and was experimental with the standard piston.

In 1911, in addition to making the sketch Exhibit 36, trying out a motorcycle piston like Exhibit 48, and trying out the piston with the Renault car of the same construction as Exhibit 48, which car I ran for a period of four months, to the extent of 3,000 miles with those pistons in it, I tested out a second motor on the block, a second Excelsior motor.

Q. Now I want to get straight on that. The motor you tested out on the block was not the motorcycle piston? A. The motorcycle piston was tested out on the block first merely to determine what the slotting would do, not as to the ability of the piston to stand up; because it wasn't mechanically expected to stand up, when it was cut all to pieces; it wasn't expected, that wasn't what it was to find out; it was to find out the action of the splitting. Then to further carry out the idea so that it came under my observation and the observation of my mechanic, a set of the pistons of the type of Exhibit 48 were constructed and tested on a test block and then put in the Renault test car for the purpose of determining what would take place and how they would operate under road driving. But it was not expected that the piston, not being designed for the job, would stand up; it wasn't expected it would give perfect results. As far as strength was concerned, it wasn't designed to be cut all to pieces. The object was to see what would happen as to the splitting and slotting to prevent slap and seizing. It was tested on the block and then put in the car and driven until November for the particular purpose of testing; no other reason than testing; no other purpose than simply for having a split skirt, and for having the idea of the split skirt. The second motor followed the motor put in the car, and that motor was put on the test block, and that motor was run, the pistons the same as 48, but the instructions were to run it until it broke it down, not particularly to break the pistons down, but to break it down to the point of whether the pistons would split, and to see what would happen. And it was run indefinitely until the break came,—how many hours, I don't know. But it was run at high speed until they broke the bolts on the fly wheel, and as soon as the bolts broke on the fly wheel, the fly wheel flew off and it wrecked the motor and cracked the crank case around the rear bearing; and that was the end of the test. But

the pistons, fortunately, as far as strength was concerned, didn't happen to break up. But there was no signs of scoring whatever under that test. That is the only thing we were after, was the idea of piston slapping and scoring, not expecting the piston to stand up as a practical thing, because it wasn't designed for the job.

Q. But it did stand up? A. It just happened it did. That wasn't a commercial job; it wasn't a job anybody could manufacture and sell, because it wasn't designed for that purpose. It was a make-shift idea to test out the idea of the split and how it would function.

(Narrative continued) First, we made the block test on the first motor, then the car test, then the block test on the second motor, No. 2 motor.

Right following the installation of the motor in the car, in the latter part of June or in July, we made the second block test. It was done within a week. A motor was on the block, and then a week after the motor was installed in the car the second motor was on the block, the No. 2 motor.

The pistons that were block-tested in the first block test and in the first motor, were the same pistons that were in the Renault car. It was the same motor and the same pistons that were installed in the Renault car. The pistons were built and put in the motor that was in the Renault car and block-tested. Then the motor was put back in the Renault car, the same pistons, no second set was put in that motor. The No. 2 motor was a different motor. Then the second block test was started with a different motor after the first motor was put in the Renault car.

The first test was the motorcycle test. That was as far as that went. The third test was the last motor, the second automobile motor. The first test of automobile motor was the block test; then the motor went into the car; then the car was driven in the road test. That is why they were put in there. Then a second motor was built shortly after; that is, not built for the purpose, but a second motor installed for the same kind of piston, and that was on block test so it could be under observation as well as the car on the road was under our observation.

Q. And the second block test with the pistons of the sort of Exhibit 48, that turned out satisfactory, too? A. That turned out satisfactory as far as the slotting or

splitting was concerned, and seizing and piston slap. It didn't break down, but it wasn't a satisfactory design. It wasn't a practical design for the job.

Q. It wasn't a practical design, for you hadn't designed it in the first place for the slitting? A. I had designed it in 1911, but hadn't any special patterns made to cover the particular purpose. This was merely a substitute to find out what the effect of slotting would be.

(Narrative continued) The changes I contemplated making were the same as in January 1911, when it came to actual design to properly fit it up. That is, with the web structure. I never contemplated using a piston like Exhibit 48 at all in commercial practice, because it wasn't practical in design. It was very light in structure after it was split down, there was nothing to hold it to form; it was just a happenstance it stayed together. I thought it needed webs and thought it needed different things to get practical results from practical and mechanical design. In other words, similar to the design in January 1911, and like my later design Exhibit 32.

If you don't want a piston without a web, I can't see anything wrong with the design of Exhibit 48, as far as general proportions are concerned.

If you don't want to use any webs in a piston, I see nothing wrong with the design of the piston, from the standpoint of strength of materials and proportions, if it wasn't slotted.

Q. Well, you didn't find it wrong when it was slotted? A. I didn't find it wrong; it was just a miracle it stood up. I wasn't testing it for its strength; I was testing it for its ability to take care of the slotting.

Q. You say it is a miracle. Is it an actual fact that none of those pistons broke? A. One broke.

Q. Where? A. Broke through the center bore, through the slot.

Q. You said yesterday that might have been an inherent defect in the casting. A. It might have been, but the fact is that it broke; whether it is a defect or whether it is a break. The steel might have been spongy at that point, but still not putting it under a magnifying glass, you couldn't see it; nevertheless, not being sound metal, it might have broken like other pistons do break.

Q. It might have been true of the web construction? A. It might have been.

Q. But as far as that particular design like Exhibit 48 that you actually fully tested twice and one piston was

block-tested and then run for three thousand miles, you didn't find anything wrong with those pistons from the design standpoint now, did you? A. Yes.

Q. What was wrong with them from the design standpoint? A. They weren't designed for the job. They were liable to let loose at any time. The fact that one did let loose was an indication under severe and continuous service more might have let loose if driven hard enough and far enough.

Q. In those days pistons let loose in commercial cars in three thousand miles? A. They let loose in a lot less than that; and the same thing happens today.

(Narrative continued) In those days, in order to determine if a piston was practical, there was no given miles at which it had to be run. They were put on the test block, fitted with normal clearance, and they would run during 24 hours, night and day continuous; in other words, run perhaps three hours on a light load to break them in, then four or five hours under a certain heavier load, and that was continued on up until they took the last two or three hours under full load; if the motor didn't develop any trouble under the last block test load, under the heavy load, no overheating or no signs of piston trouble that the tester could determine, and if they were expert operators they didn't need to tear the motors down to find out, but could tell without doing that, why, that was proof enough that everything was going along in good condition, and then the general operation was to open the pistons at the base of the motor and shove them up to the top of the head, and then to examine the cylinder walls, and if no signs of metal sticking to them, or other indications, that motor was considered good, supposedly that motor was considered good enough to drive them in the car. They might have been driven two days in the car, or it might be driven all summer, or that car might not be driven maybe two days on the road, maybe 100 or 150 miles, maybe less and be reported in by the driver that it is O.K., and it goes out to the customer, and he may not drive it 500 or 1,000 miles, when he comes back with a holler that it has a frozen piston, and he can't account for it, but it did happen, and it does happen today yet.

In 1911 it happened with the solid type piston, not with that piston it didn't happen. We didn't have any freezing or give out in any form.

Q. But the test you gave in 1911 with the Renault car was a good deal more rigid than any test given in 1911 before a car was turned over to the customer as a good piston and a good car? A. No, it wasn't any more rigid because I didn't have the ability to test it any different. I didn't have the ability. The block test on the first motor was short, maybe a matter of 24 hours. That was sufficient to show it didn't seize or score. That was the main thing I was after, to avoid piston slapping or seizing. It didn't do that all right; but I knew the piston wasn't designed and wasn't right for the job, and one of them did give way on the first motor; the No. 2 motor didn't give way, and did its work, did its work satisfactorily. That is all right with that individual motor, but any engineer or practical mechanic would know the piston was not properly designed for the job as a commercial affair; as an experiment, it was an experimental piston.

Q. You say that just because you took a factory piston and split it? A. I say that because I took the factory piston and split it; it wasn't designed for the job; it wasn't practical; no engineer in the country would say that was a practical piston to sell; it wasn't practical; I wouldn't think of putting anything out like that in manufacture. It wasn't fitted for the job. If you took the piston and redesigned it for the inside, redesigned it with the ribs put in such form, changed around with the ribs extending lengthwise and various other things, to make it a more practical job, to make it a real job; but that piston couldn't, as it was, be sold and form a practical job out of it. But the purpose was to demonstrate its ability to do what it was supposed to do to a certain point. How far that could be carried, I don't know. In one car it was carried four thousand miles; in another car around three thousand miles; in the block test it showed its ability to stand up.

Q. You were perfectly satisfied with its performance, weren't you? A. I was satisfied with its performance as far as slotting was concerned, but not with the other parts.

Q. Not with the design? A. Not with the design.

(Narrative continued) I was satisfied with the design a little later; I was satisfied with the design made in January, 1911, in that it would have been a much better type, and the later refined job in 1914 Exhibit 32 I considered pretty near the last word at that time in design.

In 1914 I had castings made of Exhibit 32, but I never had them machined. I saw the castings in November, 1914. It wasn't much of a job to machine those castings. I can't say what month the patterns were made for that job. It was after the drawings were made, of course, but just when the patterns were made, I don't know; I can't remember. We had the castings; they couldn't be machined because the company was in the hands of the receiver. By the time I got the castings the company was in the hands of a receiver. I was away when the castings came in; I was away in the East; when I came back I saw the castings.

I was interested in those pistons to see that they would turn out all right. I could have had them machined if the concern hadn't been put in the hands of a receiver. I expected to have them machined because we expected to get the company back into our hands, but I couldn't go ahead with it without capital. Not having the shop in my hands where I could have them machined, that is what held it up.

During the latter part of 1911 I made an effort to file application for patent. I turned the sketch 36 over to James Offield. That was in the fall of 1911. It was in 1911 or the first part of 1912; I will place it that way. It was right close to 1912. I am positive that it could not have been 1913. I am just as sure of that as of the rest of my testimony that it couldn't have been in 1913.

I testified in interference proceedings in the Patent Office, and my memory was probably fresher in 1926 than it is now.

Q. On pages 47 and 48 of the record in the interference proceedings, in Interferences Nos. 49,569 and 49,570, and 49,571, you testified as follows: "About what were the dates that you showed Exhibits 1 and 2 to Mr. Offield and Mr. Pond? A. Exhibits 1 and 2 were turned over to Mr. Offield, as near as I can recall, in 1913." You may examine that. You testified like that? A. That is all right.

Q. Your mind was fresher? A. It might have been and it might not have been. I might have made a mistake in that testimony. I do recall though, however, that this Exhibit 36 was turned over to Mr. Offield while he was in the old office. That was while I was with the Excelsior Motor Company. That I do recall. That other testimony there, I probably was not clear on.

(Witness continuing) My mind might have been fresher in 1926 in some ways, and on the other hand there are some things that I remember now I didn't remember then, when the testimony was taken.

No sketches or drawings like Exhibits 32 and 31 were ever turned over to Offield, but I did turn over sketches of the sleeve valve motor to Mr. Offield. It was that same type sleeve valve motor, but no sketches copied from that, but similar to it. Those sketches did not have an illustration of a piston on them. They were just sketches of the sleeve valve motor itself. The reason for that was the sleeve valve motor was started two years prior to 1911.

I got the original sketches back.

I don't know how long Mr. Offield had those sketches Exhibits 36 and 37, the sketch and description. Mr. Offield was in the old office and was separated from the parent company and went in by himself. He had them a number of months; I can't say how long. I couldn't get any action out of them, so I finally turned them over to Pond. The old name of Mr. Offield's firm was Offield, Towle, Graves & Offield. That was the firm's name in 1911. That was the firm that did all my work from 1907. I never knew the firm by any other name than Offield, Towle—It was originally, I think, Offield, then it was Offield, Towle & Graves; then Offield, Towle, Graves & Offield; that was the junior Offield. Pond was connected with Offield, Towle, Graves & Offield. Pond was the man that did all my work in their office.

I don't know when Mr. Graves became a member of that firm. I know he became a member at any rate. I said it was originally Offield & Towle, then Offield, Towle & Graves, and then Offield, Towle, Graves & Offield.

I don't know whether Mr. Wilson was with that firm at that time. I met Mr. Wilson after he became associated with Mr. Pond. I never knew him before that. I suppose his name was Ira Wilson, but I don't know.

I asked Mr. Offield to file an application for patent. The application was filed. I must have paid him for filing it or he wouldn't have filed it. Somebody filed the application; I don't know who filed it, but I know there was one filed.

The application filed was on the motor. He never filed the application on this particular piston. Either Offield or Pond filed on the sleeve valve motor, or the other office did; but the application was filed on the sleeve valve motor. A patent never issued on that application.

I don't know when the application was filed. The papers were turned over to Offield in 1911, but I don't know when the application was filed. I have no means of knowing when it was filed. I don't know when it was filed. I turned them over the latter part of 1911, or around about the first part of 1912 to Offield, but I don't know when he filed the application.

I never turned over a drawing to him like Exhibit 31. That was a sleeve valve motor of the same general type, but the drawing was not like that. The drawing simply showed the construction of the motor, same construction as that, but not detailed like that; that was a working detail; that was a model of the real motor. This is a cross-section of the motor, Exhibit 31; that is what I turned over to Offield.

Exhibit 31 is further developed than the drawing that I turned over to Mr. Offield to make the application from, so far as detail is concerned, but not the principle. It was my practice to turn over to patent lawyers the best design I had; and the design was just as good as that, but the detail was not so fine; it showed the very same working parts. It did not show the piston. It showed a piston inside of the sleeve valve, but that drawing was made two years prior to 1911; that drawing was made before I was to Chicago in 1910. I mean the sketches of the sleeve valve motor.

I did not have in my possession at that time a drawing or blueprint like Exhibit 31. At the time that I instructed Mr. Offield to go ahead with that application on the sleeve valve motor I did not have a blueprint, but I had a drawing which showed the valve construction, the same type of construction as is on that drawing, but it was not like that drawing as far as appearance was concerned; it was more crude; it wasn't there in detail. In other words, Exhibit 31 was made in 1914; I didn't have it at that time.

Mr. Offield then filed the application on the sleeve valve motor, but he never got to filing the application on the piston. He had it five or six months, possibly more; I don't know how long. Mr. Offield at that time, after he had separated from the parent concern, it was in his possession until after he had separated. I don't recall that he had anybody in partnership with him; he wasn't giving much of any attention to his office or his business. Most of his time and attention was given to the Wrigley outfit and by various correspondence and taking it up with him whenever I was in Chicago, didn't de-

velop anything; he didn't get anywhere; never had the time, and he never was settled in his office.

I haven't any of that correspondence now. It was burned up in my house in Mishawaka, burned up with a lot of other correspondence. That is why I have no correspondence with the Packard Company. I haven't looked for it at the Amplex Company or the Excelsior Company because they have been out of business for years. I haven't one scrap of correspondence with Offield or Pond or anybody else.

Exhibit 36 was given to Mr. Offield. The sketch and the description as they are attached together here was in Offield's possession. He didn't return them to me by mail. I went to his office and couldn't get any action, and in talking it over with him he told me he wasn't able to get to it, and I asked him if he had any objections to turning it over to Pond, and I don't recall whether Pond was in by himself with Wilson then or whether he had left the old company of Offield, Towle, Graves & Offield which he was then associated with, and he had been associated with when he was doing my work prior. Offield had no objection. I went down and saw Pond and he was willing to take it over. Now whether I took the papers myself down—as I recall it, they were both on the same floor, right close together—whether I took the papers down to Pond myself or whether I instructed Pond to go and get them, I couldn't say positive, but they were turned over to Pond from Offield's office, either through me or by Offield himself, or Pond possibly might have gone up and got them.

I would say that Pond must have got them in either 1912 or 1913; they must have laid in Offield's office for maybe a year or better; I don't know how long they laid in Offield's office. I don't remember. I don't remember the date they were turned over to Pond.

I don't know how long I kept after Mr. Offield to file the application, possibly six months or a year; it was a long time. I don't know how long it laid there, and I don't know when it was turned over to Pond.

I don't know how many applications for patents I filed in 1912; in 1912 there weren't so many. No, I don't recall in 1912 filing any particular application.

Pond was the only patent lawyer I dealt with in 1912. After that they took the step from one firm to the other; that was the only firm I dealt with. I know other patent lawyers, but I didn't deal with them.

I was in and out of Chicago at that time. I presume Chicago is full of good patent lawyers, but I didn't know many of them. Practically the only ones I knew in Chicago were the Offield, Towle, Graves & Offield outfit, and the Hibben, Davis & Machuley outfit.

(Short recess taken.)

Q. Since when has Louis G. Vanderlip been prosecuting your applications?

Mr. Richey: I object to this as immaterial. It seems to me we are going pretty far afield.

The Master: Oh, I think he may answer, and you may have your exception.

A. I think he started—I think he did my first work in about the year 1917.

(Witness continuing.)

He is a patent lawyer in Elkhart, Indiana.

As to the firm of Wilkinson, Huxley, Byron & Knight of Chicago, the application on the ornamental engraved metal and method of producing the same was filed with them. They were the Conn Company's old original patent attorneys, and it was their wish that I continue with them.

I became connected with the Conn Company late in the fall of 1915.

After I turned the sketches in question, Exhibits 36 and 37, over to Mr. Pond, they also laid around his place. He might have taken action on the matter; it might have been him that filed the motor application; that I don't know; but there was nothing done on the piston application. I asked him to file an application on the piston.

I think it was around 1912 or 1913 that those papers were turned over to Mr. Pond; somewhere in that neighborhood; I don't remember the date it was turned over; between the period of the latter part of 1911 or the first of 1912, and the time in which he turned them back to me.

I didn't file any applications for patent on other things during 1914 that I recall, and I can't recall what was filed in 1913.

I know this motor was filed somewhere back in the neighborhood of 1912, but I don't know just when or where or who by.

The fifty odd patents which I took out were spread over a period of twenty years. They went back as far as

I would say, as 1888, '88 up to, well, up to three years ago, two or three years ago, four or five years ago, something like that. I am taking out patents all the time, but I can't tell where they are strung along or what they are.

I was not in a financial position to make application for patent on this piston during the years 1912, 1913 and '14. I borrowed the $1400.00 to give to the Amplex Company for patents.

Q. You couldn't have borrowed enough money to file an application, could you? A. I was just about down as low as any when I bought that. That is what I considered my salvation in getting that back.

(Witness continuing) I paid for that Amplex car in 1914. It was around $600, I believe. I raised that cash and advanced it to the company and more than that in the fall of 1913, late in 1913, about the first of '14 and up until the time I took the car, or just prior to the time I took the car.

I was not drawing a salary in 1914. I had nothing to live on except what I had coming in, borrowed a little from my father, and I borrowed a little from my wife. I borrowed from my father to buy that patent with. I had no property.

I raised enough money to file an application on the sleeve valve motor; I don't know where I got it. To my knowledge, that patent was never issued.

This experimental piston, Exhibit 51, was put into a Buda motor in about the middle of 1914.

Q. You mean the Buda motor in the Amplex car? A. Buda motor in the Amplex car, and was driven as an experimental proposition until about the first of November, 1914.

Q. That is your opinion that it was an experimental proposition, isn't it? A. It is not my opinion; it was purely experimental; that is all that was put in the car for, not as a manufacturing proposition; purely as an experimental proposition, to determine what the aluminum piston with the split idea on it would do so it could be under actual observation under road conditions, under normal driving conditions, and in driving conditions so it could be under my observation and the observation of my employees.

I have had quite a good deal of experience with patents. I know patent laws only fairly well. I don't know

as I know what the prerequisites of a valid patent grant are, or what is necessary that I should or should not have done.

Q. Well, you know one of the prerequisites is that it shall not have been in public use for more than two years before the filing of your application? A. It was not in public use.

Q. Yes; it was not in public use—I say you know that was the law? A. I do not.

Q. You didn't know that at all before today? A. I didn't know that was the law.

Q. You didn't know if a thing had been in public use for more than two years before you filed the application the patent would be absolutely invalid? A. I didn't know that, and this was not in public use.

Q. I have not asked you that at all. I asked you if you knew that. A. I did not know that.

I didn't know that of the fifty patent applications which I signed, every oath carried that statement in it, that the patent had not been in public use. It was never brought to my attention before. I never read that oath before. I don't know that I read that oath in all the fifty patent applications I filed.

I said this was an experimental piston because it was nothing else.

Q. What is the definition of an experimental piston, in your opinion? A. An experimental piston is a piston you are experimenting with to determine the results of any improvements. A fully developed piston that is manufactured and put on the market is a perfected item. That was not perfected as far as construction was concerned. I was trying to determine from an experimental standpoint and actual tests what an aluminum piston with a split skirt would do, whether it would perform all the services I expected it to perform, which it didn't perform in gray iron.

(Narrative continued) I did not talk about these things with anybody last night after I left this room.

I have not been told by anybody that an experimental piston is a safe thing under the patent statute.

Q. You didn't bring up this matter of experimental piston yesterday, did you? A. I wasn't asked.

Q. You did say yesterday that the pistons, all of those pistons, the one in the Excelsior car in 1911, the

one in the test block in 1914, and one in the Renault car in 1914 operated to your entire satisfaction? A. I did not say that.

(Narrative continued) I said that the piston in 1911 as put in the Renault car, and the test motor that was run in 1911, operated satisfactorily as far as the split skirt idea was concerned, that was all. While they did stay together, that was all, and the piston that was operated in 1914 in the Amplex car, in the Buda motor, operated in road tests also satisfactory, but was not a practical or mechanically constructed proposition as a merchantable article, but it did operate as far as the splitting was concerned and as far as seizing and piston slap were concerned. That was all I was interested in, was to test it out. It was purely experimental; it was not put in the car for the purpose of simply having a set of aluminum pistons in there, because aluminum pistons weren't in vogue at that time. It was put in there for the purpose of finding out things. That is what I did find out, as far as I was able to observe it, it was under my personal observation, and the man who installed it, every day, when the car came in the shop, he always had it open and always would listen to it. That was one of the ways a good mechanic could tell, by the sound, to determine whether it was going right or wrong. My operation of it on the road was to observe how it went along the road, what the fuel consumption and oil consumption was, and how it compared with other jobs as to oil consumption, and how it ran, but it wasn't up to me, as long as it was running all right, to take down the pistons. If you had two or three motors and could have one on the test block, run one there, and have another one on the road, and run it all day long, it would not have been necessary for me to drive the car so much, but I drove the car to put mileage on it so that it would be under my observation, and that was the reason that I drove the car so much as I did. Another reason, so you may understand the situation, when the pistons were taken out of the car, I was going to sell it. I had no idea the company was going into the hands of a receiver. If the company hadn't gone into the hands of a receiver, those pistons would have been placed in a single motor, in a Buda motor, in a runabout. I was a single man and I had no need for such a large car. But when in November the company went into the hands of a receiver, everything went out of my hands and that ended the plans, and that was the history of the run of the Buda motor.

Q. During the run of 3,000 miles of pistons like Exhibit 48 in the Renault car, you just kept close track of it to see how it operated? A. Every day that the car came into the shop.

Q. And it was listened to? A. It was listened to by me. When I would get out of the car I would always listen to it. I was always listening to it when I was driving.

(Narrative continued) I opened the engine up once to see whether it was possibly scoring the cylinders. Opening it up once in 3,000 miles was sufficient; no other manufacturer would attempt anything different when he had the car on the road; it isn't the practice. That once was when the piston was broke; it was opened up before that when the crank shaft broke. It was opened up twice. The crank shaft broke, and it was opened up. You could see inside, see up the piston walls, see they were perfect cylinders; that was evidence the pistons weren't scoring, or it would show on the side wall. It was opened again when the piston broke. That is the last time it was opened until they were taken out.

The piston in Exhibit 51, the 1914 piston, as placed in the Amplex car was never given a block test. The design of the piston was a standard piston; the only addition made to it was the ribs extending from the boss to the head to provide strength enough to keep the piston from breaking in two.

Q. You really redesigned that piston then, didn't you? A. I did not redesign it; I merely added the ribs to give it strength. There was no ribs above the boss in the old piston pattern; if the slot had been cut around, it would have cut the piston completely in two. The ribs were merely added to tie the skirt to the head.

Q. And no attention was paid at all to strength of materials or design to take care of the stresses and strains that would be encountered? A. Well, the ribs were slightly heavier than they would have been made in gray iron under the same circumstances, but there were no ribs in the original gray iron. It was the gray iron piston pattern, simply the ribs in there so it could be cut in so it could have been slotted around the top. Without that there would have been no skirt left, if it had been cut in two.

Q. You say that was not a commercial piston? A. It was not. It was not designed for commercial purposes; it was not designed at all; it was merely a makeshift thing for experimental work.

(Narrative continued) None of those pistons gave way in the car. I don't think it was a good design, from a mechanical standpoint or a practical standpoint.

I don't know of any aluminum piston in 1914 that would stand up under 4500 miles; I didn't know any aluminum pistons were being made at that time particularly; only in an experimental way.

Mr. Pond did not just keep that drawing of the piston until it was turned over to Mr. Winchester. Mr. Pond had Exhibit 36 in his possession until I called for it in the latter part of 1913 or the early part of 1914; then it was turned back to me, and I showed it to Mr. Winchester so he could get an idea of how the piston should be designed for the new motor. It was turned back to me later on, I imagine in the latter part or in the middle or latter part of '14, probably the latter part of '14. I presume I again asked him to make application for patent on it. He didn't do anything about it at that time because I had no money to pay for it.

I don't recall of other applications that were filed by me in 1914 and '15 and the first part of '16, but close to that period there were some applications filed relative to other automotive parts, not far away from that; but I don't recall just what year they were in. I believe I filed one in 1916 but I don't recall filing any in '15 or '14.

I gave Mr. Pond both the sketch and the description, Exhibits 36 and 37, after Mr. Winchester got through with them, and they were given to Pond when Winchester got through with them.

Mr. Pond never had the drawing, Exhibit 32, the details of the piston that Mr. Winchester made, to my knowledge. He might have had it or might have seen it, but I don't recall of his having it. He didn't do anything with it, and the whole matter was turned over to Mr. Tibbetts in March 1916.

Q. Now, your position is that the Renault car piston like Exhibit 48, the block test of that kind of piston and the motorcycle piston, and even the piston in the Amplex car like Exhibit 51, was just run to determine in your own mind the satisfaction that the piston would give? A. They were to determine in my mind from an experimental point the satisfaction the pistons would give from the idea of splitting the skirt and the slotting, not from the general construction.

Q. And it took all those runs for you to determine that, each time determining it over and over again?

A. It took all of those runs, and it would have taken more had I had the time and the opportunity to carry it still further.

Q. As far as the 1911 piston was concerned, you just threw that in the scrap heap? A. Threw it in the scrap heap.

Q. Didn't do anything further until 1914 to make an additional piston? A. No other pistons were made until 1914.

Q. In 1914 you permitted them to be also thrown into the scrap heap?

Mr. Richey: I think that is immaterial. He has already testified to the facts. Now he is asking him for his conclusion on this. It seems to me we are going over and over the thing. I object to the question.

The Master: Overruled. He may answer and you may have the same exception.

A. They were thrown in the scrap, but they weren't thrown into the scrap with my permission.

Q. You weren't sufficiently interested to follow up these, to locate them? A. I was, but I couldn't locate them.

Q. You made no effort to locate them? A. I did.

Q. The 1914 piston? A. I did.

Q. You tried to find out what scrap man got them? A. I tried to find out where they went. I found out they went into the scrap. That is as far as I remember. I had other things to attend to.

Q. You never tried to trace who the scrap man was? A. I did. I tried to buy the whole outfit back, patterns, pistons and the whole business. It was understood for some four or five months we were going to get the factory back; consequently I didn't spend my time searching around the factory. Later I was advised they were scrapped, and consequently I had no chance to get them there.

Q. You never found the name of the man who got them, the scrap man? A. Yes, I presume I did. I understand the greater portion of the scrap was sold to a South Bend scrap yard.

Q. Did you go over there to see if you could find them? A. No, I did not.

Q. In other words, after all the tests in 1911 and 1914 you weren't sufficiently interested to go over to the South Bend scrap yard to find the pistons? A. I was, but I wasn't able to get around to it.

Q. You didn't have a single drawing of the 1911 and 1914 pistons in your possession—I am excluding now the pistons like Exhibits 36 and 37 with the webs on them; I am limiting myself to those pistons that were actually put in the cars in 1911 and 1914. A. I had no sketches of those.

(Narrative continued) The Packard negotiations extended from March, 1916, until somewhere about November, 1917. My application here was filed November 30, 1917. The negotiations were closed long before the patent application was filed. The negotiations were closed in 1916. The money was turned over to me in 1916. The patents were negotiated for in 1915, turned over and delivered to the Packard Motor Car Company in 1916, and the settlement was made in 1916, if I am not mistaken.

Q. I want to refresh your memory. Mr. Tibbetts' letter to you, first letter to you, is dated March 27, 1916. On May 18, 1917, you wrote your last letter to Mr. Tibbetts asking him when negotiations could be closed. Those letters are in evidence. According to that the negotiations were really started in March, 1916 and ended some time after May, 1917?

The Witness: The negotiations were started earlier than March, 1916. They were started very close to the first of the year 1916, and I had forgotten that the negotiations wasn't finally settled; they were held pending on a lot of old patents. If the money wasn't turned over until 1917, then of course that is when it is, but I was under the impression,—I couldn't remember exactly,—but I was under the impression that the whole deal was closed some time in 1916, the latter part of 1916.

My application was filed November 30, 1917, and was executed around the same day. The settlement was completed and the money was paid over prior to the application of the patent, some little time prior; I don't know just how long.

During these negotiations, or from March 1916 to November, 1917, my financial condition was not such that I could have filed an application for patent. I was employed by the Conn Company, and I was getting a salary, but my finances were very low. I couldn't state how much per month my salary was in 1915, but it was not several hundred dollars a month, nor was it several hundred dollars a month in 1916 and 1917.

I think I filed one application in my own name in the fall of 1916 or in the early part of 1917. I raised the money for that. This particular piston was not involved in the receivership. That was my own personal property. There never was any question raised about that. The Packard Company never raised any question as far as that particular piston was concerned.

There was no drawings made of either of the pistons, Exhibits 48 and 51, during the years 1911 to 1914. I directed the making of the patterns, but there was no patterns made. I directed the putting in of the ribs in the core-box. I did not stand over the pattern-maker as he did it, but I showed him how to make it and he put them in. I told him verbally, and very likely I made a few marks on a piece of paper, showed him how the ribs were to be put in. No drawings were made. The same kind of verbal directions were given to the gentleman who slotted all of the 1911 and 1914 pistons.

I had perhaps two conferences with Mr. Milton Tibbetts of the Packard Company in 1916.

The rear axle suit was settled prior to negotiations for these patents.

As to the Packard negotiations, Mr. Tibbetts and I had lunch in the Auditorium Hotel in the winter, and I think that was either in the latter part of—I think that was in the latter part of '15; I am not certain—and I explained to Mr. Tibbetts at the time the sleeve valve motor idea, and another motor idea also of a double-acting motor, and also the pistons. Mr. Tibbetts just at that time was not particularly interested because he had no drawings to see; he didn't know just exactly what I was driving at with these motors in particular, but he did get an idea of the piston, and these other patents which they wanted to buy which had no bearing whatever on this piston; only on this sale which was in process. I was endeavoring at that time—they had made a proposition and I was endeavoring to secure these patents, and as they went along with the negotiations, I made them a proposition to take over the motor idea as well as the piston, take over the whole business; therefore their proposition covered the whole outfit; and the negotiations were carried on from then for some length of time until I was able to secure the old patents.

As far as the piston is concerned, what I turned over to Mr. Tibbetts were sketches Exhibits 36, 37 and blueprint Exhibit 31, among other drawings. I also gave him the description, 36 and 37.

I told Mr. Tibbetts the whole situation in the Auditorium Hotel. I don't know that I went into all of the details of the tests, but I did tell him that I had tested the pistons with the split skirt, both at the Excelsior Company and also in Mishawaka. I didn't go into details as to how those pistons were constructed. I told him how the split skirt idea worked; that is all I was interested in, all he would be interested in. I couldn't say as to whether or not that was the only time those 1911 and 1914 pistons were mentioned to Mr. Tibbetts before the negotiations closed. I might have talked with him after our conference in the Auditorium Hotel. I might have talked with him on the subject but I can't recall what the nature of it might have been or the details of it. I didn't give him any sketches, drawings or samples of those 1911 and 1914 pistons that I actually made. What Mr. Tibbetts really had to make the application on was the data just contained in Exhibits 36, 37, 31 and 32.

Mr. Richey: By that you didn't mean oral description?

Mr. Bruninga: Oh, yes, I will add to it oral description.

The Witness: Mr. Tibbetts had only the description that I gave him at the Auditorium Hotel and what I might have given him after, if I met him afterwards, if I did meet him between then and the time I delivered these drawings to him. I would say I might have met him in between that time and talked with him, but I can't say exactly.

In 1926, when I testified in the interference, my memory on that matter might or might not have been fresher than it is today.

In 1926, in the interferences, I testified as follows, on pages 70 to 72 of the interferences 49,569, 570, and 571, upon cross examination by Mr. Kingsland, counsel for Mr. Hartog in those interferences:

"XQ. 205. Mr. Gulick, do you know who prepared the application upon which you are involved in this interference? A. Mr. Tibbetts.

XQ. 206. Did you furnish the data on which the application was prepared? A. None other than have been shown in Exhibits 1 and 2."

Mr. Bruninga: Exhibits 1 and 2 correspond to Exhibits 36 and 37 in this case; and Exhibit 9 thereafter referred to corresponds to Exhibit 32 in this case.

"XQ. 207. In addition to that, had you had any personal conferences with him before the application was prepared? A. Only such conferences as were had pending our negotiations.

XQ. 208. Do you recall whether upon any of these conferences you gave Mr. Tibbetts any information relative to the subject-matter of the invention that would supplement or add to the disclosures of Exhibits 1 and 2? A. I have no recollection of such disclosures.

XQ. 209. Then so far as you now remember, the only information relative to the invention of your application given to Mr. Tibbetts was the contents of Exhibits 1 and 2; is that correct? A. The contents of Exhibits 1, 2 and 9.

XQ. 210. You desire then to correct your answer to XQ. 206 and add thereto Exhibit 9 as the extent of disclosure to Mr. Tibbetts; is that correct? A. Yes.

XQ. 211. To summarize the matter, then, Mr. Tibbetts, so far as you now remember, had before him Exhibits 1, 2 and 9 without any further information or without any other disclosures when he prepared your application; is that correct? A. It is not correct. Mr. Tibbetts had in his possession at the time Exhibits 1, 2, 9 and 10, from which he undoubtedly prepared the application. However, during the preparation of this application I did not have any conferences with Mr. Tibbetts."

Mr. Bruninga: Exhibit 10 corresponds to Exhibit 31 in this case.

"XQ. 212. I understand from your last answer that you now desire to supplement or change your answer to XQ. 210 by adding Exhibit 10 thereto; is that correct? A. My first answer with reference to Exhibits 1 and 2, I was referring particularly to the written application in Exhibit 2 but not to all of the exhibits that were in his possession.

XQ. 213. Have you now stated all the data that was before Mr. Tibbetts so far as you now remember at, before, or during the preparation of your application?

Mr. Richey: Objected to as incompetent unless this witness was present when Mr. Tibbetts prepared the application.

A. All of the written data that I know of, written or printed data that I know of.

XQ. 214. Do you know of any verbal data or information that Mr. Tibbetts had from you in addition to

the written or printed data at the time stated in the last preceding question? A. None other than might have come up in verbal conversation before or at the time I turned the exhibits over to him.

XQ. 215. Do I understand from your answer to XQ. 208 you have no recollection of giving to Mr. Tibbetts any additional verbal information in relation to the invention; is that correct? A. I have no recollection of having talked to Mr. Tibbetts or seeing him after turning over the exhibits until he forwarded the application to me for signature.

XQ. 216. Did you give to any one connected with the Packard Company any verbal explanation in addition to the exhibits you have referred to in further or fuller explanation of the invention prior to the receipt of the application papers for your signature? A. I did not."

Q. And is that your recollection today, or do you wish to modify it? A. I don't wish to modify it, but I haven't made any statement I gave to Mr. Tibbetts any information after, any written information or any printed information, after I turned these exhibits over to him relative to the application of the patent. I never had any correspondence with him, nothing when he was filing the applications or when he was preparing the applications. I have no recollection of ever having been in Detroit during that time and conversed with Mr. Tibbetts between the time I turned these various exhibits 31, 32, 36 and 37—those are the exhibits that he had before him when he prepared the application—I have no recollection of having had any conversation with him. I might have met him, but I don't recall having met him between that time and the time the application was filed. But prior to that, prior to turning the papers over, I did converse with Mr. Tibbetts about the previous experiments, and that is what finally got him interested in wanting to take these devices over in connection with the old patents.

(Narrative continued) I told Mr. Tibbetts about the 1911 and 1914 experiments, about what I had done, at the Auditorium Hotel. I might have met him afterwards and said something to him, but I couldn't say positively; but I furnished him no information that I know of after turning over these exhibits, between that time and the filing of the application.

I did not tell Mr. Tibbetts I had made pistons like 48 and 51 in 1911 and 1914. I never explained to him how I had done it. I told him I tested out the split skirt idea. The type of construction which Mr. Tibbetts got was Exhibits 36 and 37, 31 and 32.

The application for the Gulick patent in suit was forwarded to me at Elkhart, and I signed it. I don't know that I had any conference with Mr. Tibbetts at all before I signed the application. I couldn't say as to that. I don't know if there was any correspondence in addition to it or not. I read over the application and Mr. Tibbetts' letter. I don't recall telling or writing Mr. Tibbetts that he left out the 1911 and 1914 pistons like Exhibits 48 and 51. I might have and I might not have. I know that when the application was sent to me, I signed it and sent it back. There might have been corrections made; I can't say. And I have no correspondence to show what did take place. I don't recall particularly any correspondence. I don't recall of any corrections being made to the application by me when I sent it back. There might have been some made and there might not. I went over the application carefully to see whether it disclosed what I had invented; I thought I was correct in my diagnosis of it.

I don't remember when I next heard from Mr. Tibbetts after the application was filed.

(Witness handed affidavit dated December 2, 1921, from file wrapper of Gulick patent in suit, which he reads.)

I recall signing that affidavit; this refers to Exhibit 32, and attached to the original copy from the Patent Office is a photostat of Exhibit 32, which is marked B-3. I remember signing that affidavit.

There was no previous correspondence, between Mr. Tibbetts and myself between the filing of the application and the time of that affidavit, that I know of. I don't remember whether Mr. Tibbetts just simply sent me that affidavit and told me to sign it or not. If there was any correspondence, I don't remember it. If there is, the file would show it. I have no records to show for it. There wasn't much of any correspondence between the Packard Motor Car Company, Mr. Tibbetts and myself after 1917. All my correspondence was burnt up about the first of 1918. I have no letters or anything from the Packard Motor Company. I haven't a scratch of a pen to show any of my correspondence. There was

a lot of paper stuff in the garret, and they burned them up. My files were up in the garret, while they were overhauling the house.

I don't know just what the idea of the affidavit was.

Mr. Bruninga: Well, if you turn to the previous page, page 26, you will find the following statement:

"In order to anticipate the Examiner's rejection of claim 22 upon the patent to Schoengarth cited, we are filing herewith an affidavit of the applicant carrying the date of invention back of the filing date of Schoengarth. Applicant made this invention and made some of these pistons and successfully used them before Schoengarth filed, so that Schoengarth is no longer a reference." I want to say to you for your further information that the Schoengarth patent is No. 1,174,092, whose application was filed on October 1, 1915. Do you recollect whether Mr. Tibbetts sent you a copy of that patent at that time?

The Witness: I don't recall.

(Narrative continued) I do not know whether I saw that patent before that date, or not. I don't know that I ever saw it before today. This reference here refers to the split skirt only, this affidavit. By "split skirt" I mean that it doesn't refer directly to the ribs, how they were put in and attached to the bosses. It refers directly to the idea of the splitting of the skirt. I say that because it is right here, the description of it says so. It is on another page here somewhere, I saw it. That is referring to the splitting and slitting and not to the piston construction.

The Witness (reading from file):

"Claim 24 is similar to the claim 22 except that the adjacent parts of the skirt across the longitudinal slot are referred to as being entirely disconnected, which is not true of Schoengarth. This claim therefore is allowable regardless of the patent to Schoengarth as a reference."

Referring to the affidavit, page 27 of the File Wrapper and contents, the following quotation from the affidavit refers to a photostat that corresponds to Exhibit 32:

"that he made"—referring to Gulick—"or had made under his direction, drawings of said piston,

and described the same to others in this country prior to the month of October, 1915; that a blueprint of one of such drawings has been preserved and is now in the possession of the assignee of this application, the Packard Motor Car Company of Detroit, Michigan; that a photoprint of such blueprint is attached hereto; that the longhand notes on such blueprint which show in the blueprint were made by him on the blueprint prior to the month of October, 1915."

The original drawing from which that photostat was made, according to my information at that time and according to my belief, was made prior to October, 1915.

I looked at the date, 6-24-1914 when I answered, in order to refresh my memory.

The affidavit further reads: "that said invention was incorporated in an automobile engine and successfully operated in the United States prior to the month of October, 1915."

There was no piston like Exhibit 32 ever incorporated in an automobile. When that affidavit was made, that was made to cover the split skirt idea. I was not hinging on the general construction of the piston at that time.

I had told Mr. Tibbetts about the split skirt construction of 1911 and 1914, but I don't know as I ever gave him the details of how I had done it. The slit skirt I had was the whole idea; it wasn't the general construction of the piston; it was what the split skirt did. I didn't have to explain that to him; he was mechanic enough to know of what the split skirt would do regardless of whether it was mechanically perfect.

I told Mr. Tibbetts, at the Auditorium Hotel, that I had made and actually tried out a piston prior to 1915. In fact, I know I told him they had been tried out, split skirt pistons had been tried out.

Referring to the statement in the affidavit reading, "He doesn't know and doesn't believe that said invention had been in public use or on sale in this country or patented or described in a printed publication in this or any foreign country for more than two years prior to his application," I signed the application, but that doesn't refer to public use. The pistons weren't ever publicly used. That was an experimental use purely. My idea was that that referred to the use of the piston for our experimental purposes, but not in public use. I

therefore felt warranted in signing the affidavit that it had not been in public use. I looked at that statement that it had not been in public use at that time; and the 1911 and 1914 pistons did not constitute a public use, but simply an experimental use. That is the reason I was able to sign that affidavit.

Q. But you did know in 1921 at least that the subject-matter of the patent should not have been in public use for more than two years before you filed an application? A. Well, it was in use experimentally but not in public use.

Q. Well, I mean you did know that that was a prerequisite of a good patent? A. No, I don't know that I gave that part a thought, that feature.

Q. When you made the further statement in there: "and that he has never abandoned said invention," you did not consider that you abandoned those 1911 and 1914 pistons by just throwing them in the scrap heap? A. No, I never did abandon the idea.

I have no recollection of any previous correspondence with Mr. Tibbetts which would enable me to sign an affidavit of this kind. I have no correspondence to go by. If those files don't show it, I have no way of making a statement to that effect. I have no recollection now of any correspondence prior to that affidavit.

I knew what the purpose of the affidavit was; that is, to a certain extent. I didn't figure Mr. Tibbetts would send me anything in the way of an affidavit that had anything crooked or wrong about it.

I was not thoroughly experienced in patent matters at that time; it is not my business, the patent law isn't; only my own experience in taking out patents is all.

I thought I knew what the affidavit was about; but perhaps I didn't. I have no recollection about it except that the affidavit was signed.

Referring to page 32 of the File Wrapper and contents, there is a long amendment to the specification which ends on page 42, and is dated September 8, 1922. Then skipping over the Examiner's letter on pages 43 and 44, there is another undated amendment on pages 45 to 49. Then following that is a supplemental oath which was signed by me on November 8, 1922. The supplemental oath is pages 50 and 51 of the File Wrapper and contents. That is my signature to that supplemental oath on page 51. I signed that oath here in Cleveland—indicated on page 50. I signed the oath because my sig-

nature is on it. I have no recollection of any papers having been sent to me by Mr. Tibbetts between the time he sent me that oath that we have just talked about and the trip to Cleveland, other than these affidavits at the time that they were dated. The only affidavit sent to me, that I can recall, was the first affidavit on December 2, 1921.

I don't know how I happened to be in Cleveland on November 8, 1922, when that oath was signed; I can't say; I don't know whether I was going through here and stopped off here or whether I came here in connection with the first interference, or what it was; I can't remember what it was; I can't remember how I happened to be here.

By Mr. Bruninga: Well, to refresh your memory and enable you to place your dates a little bit, the interference was not proceeded with until 1926, and the testimony was taken. I think that is right. Your testimony wasn't taken until 1926, and this oath is signed in November, 1922. Does that enable you to tell me how you happened to be here?

The Witness: No, I don't know how I happened to be here.

By Mr. Bruninga: Does it help you if I call your attention to the fact that there was a certain interference between Hartog and Pomeroy that had been decided in August, 1922, just a few months before you came to Cleveland?

The Witness: I never was advised of any of the interferences between any—in this case anywhere.

(Narrative continued) I don't know what office I signed that affidavit in. It was very likely in Mr. Watts' office. I don't know what office it was in.

During the interference proceeding, page 100 of Gulick's record in Interferences 49,589-570 and 571, I testified as follows: "RQ. 366. In whose office was it submitted to you? (Referring to the supplemental oath.) A. Well, that I can't say because, to the best of my recollection the name of the institution was—well, there was a Mr. Watts connected with it; I guess that is about all I remember, somebody and Watts, as I recall. I don't know what the name of the business was, who the attorneys' office was, but Mr. Watts, I guess, and Mr. Slough." I testified to that. I just previously stated I thought it was Watts. I never met Mr. Watts, at least I don't know him personally. I have not met him since I have been

here in Cleveland. I don't know whether or not Mr. Richey was present at that conference when I signed that supplemental oath. I don't think he was. I remember reading the application over as corrected.

At the time that I was in Cleveland I made a sketch like Exhibit 51 (referring to original sketch). The sketch that I made at that time is Gulick's Exhibit 11 in the Interference proceeding, and that corresponds to Exhibit 51 in this case. I don't know who asked me to make that sketch, Gulick's Exhibit 11. I was asked to make it there in the office to show how the piston was constructed and how it was used in the Amplex car. That was merely a descriptive sketch to show how it was done then.

By Mr. McCoy: The Gulick sketch referred to appearing as Gulick Exhibit 11 in Interference 49,569-570 and 49,571 in the United States Patent Office, and previously marked for identification on page 1060 as Exhibit 33, is offered in evidence in behalf of the Plaintiffs as Plaintiffs' Exhibit 62.

The Master: It may be received.

Q. You then told Mr. Watts about the experiment, or rather the piston that you used in the Amplex car?

Mr. McCoy: It was Mr. Ray S. Gehr, not Mr. Watts, so that the record will be straight.

Mr. Bruninga: I am perfectly willing to be corrected.

(Narrative continued) I remember the name of Gehr. I remember the name of Watts. I was under the impression it was Watts. It was Mr. Gehr. I can't say that Mr. Watts was present; he might have been. It was the first time I was ever in the office, first time I ever met any of those men. I don't remember what building the office was in, but I think it was somewhere on Euclid Avenue. I recall the name "Gehr" but I don't know whose office that was.

Mr. Richey: What is the date of that?

Mr. Bruninga: November 8, 1922.

Mr. Richey: Well, Mr. Watts' office was not on Euclid Avenue in 1922. We moved up to the Union Trust I think in the spring of 1925. Before that we were in the Ulmer Building and in the Rockefeller Building; so it must have been Mr. Gehr.

The Master: At this time we will recess until 1:30.

Thereupon the witness, EDWARD J. GOLLICK, resumed the witness stand for further cross examination, and testified as follows:

Cross Examination by Mr. Bruninga.

I have a distinct recollection of making the sketch Exhibit 62 in Cleveland. Mr. Tibbetts wasn't present in Cleveland at that time, that I recall. The application was being taken over by some other attorney. The occasion for making Exhibit 62 was for description of the type of piston that was used in the Amplex car in 1914. I told Mr. Gehr or Mr. Watts about making that piston for the Amplex car. I did not give him a sketch of the Renault car piston, like Exhibit 48, at the same time, because he didn't ask for it. The information, such as was given, was verbal. I don't know just what the occasion was; I was asked to describe the piston that was used in the 1914 Amplex, and I made that sketch. What other questions were asked, I can't say; I don't remember.

I might have told Mr. Gehr or Mr. Watts about the 1911 Renault car piston, or the motorcycle piston; I don't remember exactly. I haven't any recollection of any previous correspondence up to the time of the conference in Cleveland. I don't remember whether or not I told either Mr. Gehr or Mr. Watts that I had run that piston in the Amplex car for between 4000 and 4500 miles in 1914. I don't remember telling either of them about scrapping the 1911 Renault car piston, either.

I read over the amendment to the specification, at that time, as I stated in my supplemental oath, before I signed that oath in November. It met with my approval.

I attended the Elgin road races at Elgin, Illinois in August 1911. That is where I drove that Renault car in August 1911, with piston like Exhibit 48. I don't remember who was in that race. I don't remember the drivers' names. I think Barney Oldfield was one of them; I don't remember the others. I did at the time, I knew their names, but I can't recall them now.

I don't remember Gus Monckmeier; I never heard the name. I don't remember whether or not the Eddie Staver automobile was in that race. I was not familiar with the Staver automobile at that time. I was doing business in Chicago at that time. I had heard of the Staver car but had never seen it.

I didn't see any piston that Mr. Monckmeier had in that car; I didn't know Mr. Monckmeier; and I have never seen the Monckmeier piston.

I don't know who Walter Schoengarth is. I don't know that I heard of Elmer Long, not until just about the time of this interference, the patent interferences involved in the application of the patent in suit. I never saw any of Mr. Long's pistons before that time.

I never saw any piston being put out by Mr. Weans, of Quincy, Illinois. I never saw any pistons that were being put out in the Franklin automobiles from 1915 to 1920. I did not know anything about what kind of a piston the Kant-Skore Company, in Buffalo, was putting out. I did not know what kind of a piston the Maxwell Company was putting out in 1920, 1921 and 1922.

I never knew that the Aluminum Company of America was building pistons prior to the time I signed that affidavit in Cleveland in November, 1922.

I knew nothing about the Franklin automobile agency in South Bend in the years 1918, 1919, 1920 or 1921, and I didn't know Mr. Venner that was connected with that company.

Referring to the Gulick record in Interference 49,569, page 50, in commenting about Exhibit 4 (Exhibit 45 in this suit), found on page 291 of that record, I made the following answer to question 61, reading as follows: "Q. 61. Do you know where Exhibit 4 was made, or anything about its history? A. It was evidently made in the drawing room of the Excelsior Motor Manufacturing Company, and as the motor was designed by L. P. Moocrs, I believe that Exhibit 4 was designed by him."

I know something about Mr. Moocrs. I have reference to Louis P. Moocrs, of Cleveland. I knew Mr. Moocrs from about the 1st of September, 1910, until about the 1st of 1911. I don't know that I have ever met Mr. Moocrs since he left Chicago. He never discussed any piston subject with me, or told me anything about his patent 1,402,309. I never discussed any piston subject with him. I didn't tell him anything about my piston that I conceived in 1908 and subsequently carried through the stages that I have stated, because Mr. Moocrs left the Excelsior Company in the latter part of the year, as I recall it, along about the holidays or just before. I never mentioned the piston, like Exhibit 51, to Mr. Moocrs. Mr. Moocrs did not see the piston that I put in the Amplex car in 1914, nor the piston that I put in the Renault car in 1911.

My experience in the automobile manufacturing business goes back quite a ways. I went with J. W. Packard on the 28th of September, 1898. I was not entirely engaged in the automobile manufacturing or manufacture of automobile parts until I entered the employ of the Conn Company in 1915. I left the Packard Motor Car Company and was in Hillsdale, Michigan, in the manufacture of stationary gas engines until 1905, when I organized the Amplex Company in Mishawaka, and manufactured cars until I left them in 1910; then I was with the Excelsior Motor Car Company until 1911.

From 1910 until 1915, to some extent I kept in touch with what was going on in the automobile industry, and in a good many other things. I attended the shows, and looked at the cars in the shows. Those cars very frequently showed a cross-section of one of the cylinders to show the operation of the pistons.

I don't remember the Premier-Weidley car. I remember there was a Premier car, but I don't know what the Premier-Weidley was. I don't know whether or not it was built in Indianapolis; I am not sure; there was a Premier car, but I don't know where it was built. I can't recall now where it was built, it is so long ago. I might have seen that car around 1913 and 1914; I couldn't say positively. I have no recollection of seeing the piston that was used in that car.

I did not subscribe to any of the magazines, such as "Horseless Age" and "The Automobile" in the years 1913 and 1914. I looked at them, but I didn't subscribe for them, in 1913 and 1914.

I heard of the Hershell-Spillman Company in Tonawanda, New York, in 1913 or 1914. I understood they were manufacturing motors. I did not know what kind of piston they were putting out.

Referring to "Horseless Age" issue of April 8, 1914, I never saw a cut of this Hershell-Spillman piston before, I didn't know that they ever made one like that.

I don't remember seeing the "Horseless Age" issue of December 24, 1913, page 1061, and the cut of the Premier motor on that page, around 1913 or 1914. I never kept track of any of the patents on pistons that were issued in 1913 or 1914.

I never met Edward O. Spillman of that Hershell-Spillman Company; not that I recall. I never met Gustave E. Franquist, of Brunswick, New Jersey; I don't remember the name.

Referring to my original sketch and description, Exhibits 36 and 37, all of the people that I explained that sketch and description to are dead, with the exception of Mr. Offield, Mr. Pond, Mr. Tibbetts, and a man by the name of Smith. Mr. Smith's first name, I think, is Harry. I explained that sketch to Harry Smith in January, 1911. He was in the automotive business, selling automotive supplies, tires, etc. at that time. I explained it to Mr. Smith because he was a friend of the family. I suppose he is still alive; I don't know; I haven't seen him in a number of years. I am sure I explained it to Mr. Smith. There were a number of women that I explained it to outside of my wife; there was Smith's wife and Mrs. Grubb; but I doubt if they would understand it the way my wife did. They were not automobile drivers, not mechanically inclined; but they were to our house the night I explained it to Grubb and Smith. The whole group was there to dinner. The women listened in, but it probably didn't sink in very far. I explained it thoroughly to Mr. Offield and my wife, and also to Mr. Pond.

I don't think I ever explained it to Ira Wilson. He was in Pond's position before he became associated with Wilson; that is my recollection. My recollection is that I obtained the paper from the Amplex Company that I made Exhibits 36 and 37 on. I am sure of this because I brought a bunch of inferior bond paper, when the Amplex Company was closed up in Chicago, with me, to use as sketch paper, and it was some of that paper it was made on. I haven't any idea where the Amplex Co. got it. It was no good for typewriter; it was no good for anything. I don't know what kind of paper that is, except that it is some sort of a bond. I don't know why the Amplex Company bought it; I presume they got stuck with it. They probably bought it cheap, and it was soft paper; it wouldn't carry a pen well, nor it didn't work well; it was considered inferior.

I am absolutely sure that the sketch and description, Exhibits 36 and 37, were made in 1911. I am positive it was made in 1911, in January. It was made at my residence in Chicago, not at a hotel in Chicago.

I said that the description, Exhibit 37, was incomplete because it was never finished. I could have added more to it; there wasn't much more to add to it, but I could have added more to it, and would have added more to it. I can't say offhand that I could have added to it

unless I read it over and see how much more, possibly, I could have inserted in it.

(Witness examines description) It was possible to add paragraphs relating to the detailed construction, describing the effects relative to possible scoring, and minor other details which might be added in such paragraphs. Also it is incomplete because it lacks my signature. It lacked my signature because I felt I had more I could add to it in the way of descriptive matters, so I didn't put my signature onto it, even though I had it back a number of times. It was quite usual for me to date sketches in those days. Sometimes I didn't date them at all, but usually I did. That is the reason that I didn't date it, because I felt at the time that I wanted to add more to it, and that is the reason I didn't sign the description. I considered the drawing was effectively complete, but I didn't date the drawing. I have no explanation for not dating it other than I didn't sign and date the description.

In my direct testimony I referred to the dotted line in the middle view on Exhibit 36, and I gave as an explanation for it that I contemplated having the ribs extend only from one side of the wrist pin boss, one side of each wrist pin boss, but I don't recall that I said anything about that during the interference proceeding.

I would say the drawing and description, Exhibits 36 and 37, are sufficiently clear to show a mechanic what it ought to be, give him the idea and principle.

In discussing the matter with my wife, I very likely told her that the webs were flexible; I explained it to her clearly. I don't know all that I told her, but I explained the construction of the piston thoroughly to her.

I presume there was something said about the flexibility of those webs, in the interference. I don't remember now offhand what was said in the amendments of September or November, 1922, in regards to flexibility of ribs. I can't say as to whether or not the flexibility was mentioned in my description.

(Description, Exhibit 37, handed witness.)

I think that question is covered in the first paragraph of Exhibit 37—"relating to an engine piston which provides for and prevents seizing, binding or scoring when hot or oversize." I think that covers the situation where the ribs are slightly flexible or in what portion of the piston the flexibility takes place. In Exhibits 36 and 37 there is no specific statement to that effect.

But, however, the explanation in the first paragraph and the last paragraph would lead any mechanical mind to believe that there must be a certain degree of flexibility there, inherent flexibility. There is a certain amount of flexibility where I provided a slot. The ribs would have to be extraordinarily thick to prevent any flexing.

In other words, with the pressures that are encountered when a piston operates in a cylinder, and with the expansion taking place, the ribs would have to be extraordinarily heavy in order to prevent closing of the slot a sixteenth of an inch, or even a thirty-second. It is inherent in the structure; you can't get away from it.

In Exhibits 36 and 37, I called the piston an "engine piston," while in Exhibit 32 the description, in my handwriting, is headed "cross-head type." That inscription was put on there around July 1914. I called that a cross-head type piston because it has ribs extending from the bosses across to the skirt. At that time I didn't know there was any piston made like that, but the cross-head type, or cross-head piston, as you might term it, I think at that time was practically unknown; but what is known as cross-heads are where the two heads cross, where the piston bearing surface—

I wouldn't say I was originator of the cross-head type or the word "cross-head." I used that term "cross-head" because the piston is of a cross-head design. I heard the expression "cross-head" used all my life in engine construction. I don't know that I ever heard of the expression "cross-head type piston" being used before I applied that description in July, 1914. I never saw a gas engine piston that was constructed of a cross-head type.

My 1911 piston was a cast iron piston, and in that kind of a piston you don't have to worry so much about expansion of the skirt as you would in the aluminum piston. I do not know of any cast iron piston today that is split. I don't know that I ever saw a cast iron piston that was split being marketed. I don't know that I ever saw any that was split, outside of the one that I made in 1911, but I do know that they gave an awful lot of trouble when they were not split.

I drive a Packard automobile that has aluminum pistons. I have driven General Motors cars. I never owned a General Motors car, but I have driven a lot of their different models; I don't know what pistons they have got in now; perhaps they use nothing but cast iron pistons in all of their cars. I didn't own a Buick.

I considered it very desirable, in 1911, to split the skirt of a cast iron trunk piston, for the very reason that the material that was in pistons at that time didn't act like the materials in pistons of this day, and neither did the cylinder walls. There never was a cylinder that was machined in those days that wasn't out of round in a very short time after it was used. Some people put pistons in that were not heat treated. In those days there, the new metal not being the same, the resulting expansion in the cylinder was entirely different; one piston might have three-thousandths of a clearance and run perfectly—another might have five-thousandths. Those were the difficulties in those days. Today the situation is entirely different.

Separating the skirt from the head by a slot helped very materially. It helped some, even though it wasn't slit longitudinally, but not enough to make any material difference. It helped some in preventing the heat from creeping down into the skirt, but didn't help very much in expansion. I base that on actual tests made in 1911. I am not speaking about slots around the top. The tests of the pistons which I slotted showed distinctly they were far superior to the pistons that were not slotted in any form. The slot around the top is generally known not to convey so much heat to the skirt; naturally, it would help it some in not expanding. Nevertheless, that is not the full answer to what we are trying to arrive at.

It helps some in dissipating the heat, in a cast iron piston, to simply put a slot around the top, by preventing it from running down into the skirt.

Exhibits 36 and 37 were always attached together by a clip. I don't know what kind of clip it is; there is a clip of some kind on there. They have been kept together; they have always been together; those two were never separated, not to my knowledge—unless somebody took them apart when I didn't have them. They were always fastened together like that (indicating). I mean these staples along here (indicating). I have always had them in a folder like that. I don't know where I got that folder; I presume very likely that came from the Excelsior Company. I did that although I didn't complete the description. When I left Chicago I packed things up and put it away, and that was the end of it. As far as I know, those same fasteners were put in there. There may have been one added since; I don't know. It has been together in just that form since 1911. I think the cover paper is as old as the other paper inside; the

cover might have been changed, and it might have been taken apart for photographing and put back together again. It looks to me as though it was the original thing.

In describing Exhibit 48 and how it was made and the motorcycle piston (referring to the 1911 piston), I stated that the reduced diameter of the head was carried down to the slot; overlapping the slot. I am positive that was done in 1911. I don't know whether I said anything about that in my interference before the Patent Office, or not; I don't remember.

I don't think I ever saw the Long patent that was in interference with my application at that time. (Examining Long patent 1,395,741.) On page 2, line 4, of this patent, reading:

> "In a piston of this improved character it is preferable to have the solid end 1, of the piston of a lesser diameter across the peripheral surface adjacent the piston ring recesses 2, than the remaining lower portion of the piston, said diameter adjacent the solid end of the piston not being considered relative to this improved invention, as the usual type of piston rings mounted in the recesses will automatically take care of proper expanding, contracting and packing relation relative to said solid piston end,"

this does not read anything in connection with the relation—overlapping the slot; it says nothing about overlapping the slot. That is mere clearance of the head down the length of the radius, same as on the standard Excelcior piston. That would stop at about the lower ring, and it would not be adjacent the lower ring groove at all. It would overlap the lower ring groove, but it would not run down to the slot that you have got in question.

I did not see any Long pistons at all during that interference proceeding.

(Recess.)

Mr. Bruninga: In fairness to the witness, I would like to have Mr. McCoy state that the Exhibits 36 and 37 as now bound, are in a cover which was really furnished by me at the last session. That is correct, Mr. McCoy, isn't it?

Mr. McCoy: That is correct. It is also correct that, to the best of my recollection, there was a brown cover on those papers when we first obtained them for use in this interference; but I

would not be sure about that, nor how it was bound. They were bound up; I know they were together, at any rate.

Mr. Bruninga: I would also like to read into the record certain parts of the interference record. Page 42 of the record shows that Mr. Richey produced the sketch, then called Exhibit No. 1, and which is now Exhibit 36, as a separate paper. Page 45 shows that the description was introduced as a separate paper, as Exhibit No. 2, now Exhibit 37. The witness was, however, asked this question (p. 45): "Were the two of them ever attached together? A. They were."

(Narrative continued) (Witness handed record) I testified as stated at page 45. The papers were attached together in a folder, and I didn't recall that they had ever been taken apart; I knew they were in a folder. My supposition was that was the original folder. They were not loose in the folder. They were pinned together; they were clipped together in some sort of a way, but I overlooked the fact they were ever taken apart; if they were taken apart in the interference, I have forgotten it. They passed through different hands in that form, clipped together.

Q. That is what I mean, clipped together. Referring to the Long patent, No. 1,489,499, page 1, line 80, reads as follows: "Inasmuch as the cut out portions provide resiliency to the body portion 2 of the piston, in order to take care of the greatest amount of expansion of the solid head of the piston, the periphery of the piston adjacent the solid head is made smaller in diameter than the remaining portion of the piston, as designated at 11, as the piston rings when mounted in the recesses 12 will provide the cylinder fit for the solid head 1, whereas the cut out portion 4 and tongue-shaped portion 8 of the body portion 2 of the piston will yieldingly bear against the cylinder wall." Just for the purpose of identification,—in your 1911 piston you had that idea of reducing the skirt part below the last ring band and running into the top groove,—that was your idea? A. Yes, the head was reduced to overlap the groove.

Q. Well, the head and also the skirt part below the lowest ring line, if we can call that a skirt part? A. The head constitutes all the rings.

Q. And also the part below the ring? A. It would constitute the part down at the slot; that would constitute the head.

I never found any relief necessary in either the Renault car piston or the Amplex car piston, that is, relief in the neighborhood of the wrist pin bosses; never put any relief on them. No relief was ever given the pistons, such as shown in Exhibit 51, in the region of the wrist pin bosses. The expansion of the head would carry the skirt in the region of the wrist pin bosses with it so as to press against the cylinder and cause a wedging action, to some slight extent, yet not enough to be of any serious consequence. We never found any trouble with it in that respect.

Q. There is no necessity in a piston of this kind like Exhibit 51, to have relief offset in the region of wrist pin bosses?

Mr. Richey: I object to that as calling for a conclusion of the witness. He is a fact witness and he is asking all kinds of opinion questions. He certainly makes the witness his own, going outside the direct.

The Master: I think he may answer. He is the inventor. He can give his opinion for what it is worth. Same ruling. Objection will be overruled.

(Narrative continued) There was no occasion for putting relief on the pistons because they were tested out and they worked all right. That piston was satisfactory as far as seizing and scoring was concerned. That piston probably wouldn't have seized.

We had no trouble in a piston like Exhibit 48, with the sharp corners splitting off, nor did we have any trouble with the piston like Exhibit 51. I did not find any of them split off after three thousand miles, in using Exhibit 48. I found no corners split off in a piston like Exhibit 51, in 1914.

I ran that Renault car, with pistons like Exhibit 48 in it, at sixty miles an hour, over ordinary gravel, stone and concrete roads. They had tarvia roads, stone roads; sort of the same concrete through to Michigan City, by way of Valparaiso, and hard gravel roads; they were all good roads; not all concrete. Racing speed in those days was higher than that. There were lots of cars that could make sixty miles if they had everything in their favor. I drove at sixty miles an hour for only short

distances. You couldn't ride those roads continuously; that is, with machines. You might get up to sixty miles an hour for half a mile, maybe a mile.

The Western Foundry Company, of East Bridgeport, I believe, was the Manufacturers Foundry at Bridgeport; Manufacturers Foundry in the East, is where some of the pistons were made. It was East Bridgeport or in that neighborhood somewhere, between some of those eastern cities.

The photograph, Exhibit 60, doesn't show the piston; you couldn't very well see it. Harvey Wilson, who was with me on that trip, never saw that piston. I explained it to him as thorough as I could, so that he understood the idea. He was an automotive expert in the employ of the company at that time, or had been.

The 1911 Renault car piston possibly had two tapped holes in the wrist pin bosses, but only had one set screw in the pin. I don't know whether or not this piston was of semi-steel; they were supposed to be; the semi-steel in those days was sort of a cast job.

Referring now to the Amplex piston of 1914, of which Exhibit 51 is a sketch, the only alterations I made to the core box was the putting in of those two little ribs extending from the boss up to the top. There was no change made in the thickness of the skirt at all. It was an extra heavy piston to start with; it was not designed to fit that motor; it was sort of what you might call a "bastard" size piston. The pattern for this piston could not have been used for the piston of my sketch, Exhibits 36 and 37, and the blueprint, Exhibit 32, unless it was built all over. Nor could it be used for the outside. It wasn't proportioned; it wasn't designed to fit that motor; and could only have been used if properly designed by building it all over, both patterns and core boxes. We didn't have to change it to make the piston corresponding with Exhibit 51. All we did was put the ribs in the core box, and left the walls to whatever thickness they came. If I had wanted to make the piston with the ribs running crosswise with the bosses to the skirt, then it would have required new core box and new pattern. No, you probably could not use the same core box and pattern—there probably would have been too much metal on the core box itself; unless you made a new core box it wouldn't have the proper dimensions. You would have to redesign the whole job, rebuild the whole job.

I am absolutely sure that the 1914 Amplex piston was slotted all the way around at the top. Even though some of the other witnesses say it was not, I still say it was slotted all the way around the top the same as that; it absolutely was.

That slot was cut in a lathe when it was turned, not with a saw. The tool room that turned out the pistons cut that slot in there. I don't know the man's name who cut the slot, nor the man's name that did the machining. I know who the foreman was in the tool room, but I don't know who did the machining. Mr. Winchester was there at that time.

Mr. Richey: I object to counsel testifying.

Mr. Bruninga: Do you deny Mr. Winchester said that?

Mr. Richey: I don't know whether he did or not. I object to it.

The Master: He may answer.

(Narrative continued) I don't know what Mr. Winchester said, but I know it was slotted all the way around. Mr. Winchester was in the drafting room; he had practically nothing to do with the machine shop. I don't know where he would get his idea that they were not slotted all the way around. Mr. Winchester was not put on the job of designing that piston. Mr. Winchester designed Exhibit 32, but he was in the drafting room; he wasn't spending his time in the machine shop, so consequently he didn't know what was going on in the machine shop or the erecting room; so I don't know how he could say this piston as it was used in that car wasn't slotted all the way around, unless he got the wrong impression.

Mr. Winchester might have wandered into the machine shop, but his business was to stay in the drafting room and design all their stuff; he had no business in the shop.

There was no reliefs in the region of the wrist pin bosses in Exhibit 51; it worked all right without it. There were more than seven castings made. The first run of castings were spongy and full of blow-holes, and those were thrown out. There were seven castings made, an extra one made because we didn't know but what one might be spoiled in machining. We wanted one extra, and one was broken; one was broken in some form in the assembly.

The piston like Exhibit 51 was a sand cast piston. I wouldn't say that it was absolutely perfect as far as

blow-holes and pin holes, etc. are concerned. There were minor pin holes in it, but not enough to do it any particular damage.

As to the mileage the car, with pistons in it like Exhibit 51, was run with those pistons in it, I can't tell from Exhibit 28 how many miles the car was run with the aluminum pistons in, but it was run 816 miles with the iron pistons in the Buda motor. That was the speedometer record. The back of the exhibit shows 6,112 miles. That was when the car was turned over to Cook, and it was sold; it had approximately 6,112 miles on it. There is 816 miles off of it, would leave the net mileage that the car was driven with aluminum pistons in it, about 5300 miles, between July to November of 1914; it would be in that neighborhood. It was driven very little after it was changed. It might have been driven a hundred miles after the pistons were changed. It was driven approximately 5000 miles with those aluminum pistons like Exhibit 51 in evidence, from July to November 1914.

I don't know who put the notations in red ink on the front of that Exhibit 28. I was under the impression that Randall did, but I think—and I am not quite positive it wasn't Randall—I think it was Randall's assistant, the day I received the bill of sale.

I don't know that I asked Randall to put the mileage on that. The bill of sale was ready for me; I went in the office and got it along late in the afternoon, and I give Randall's assistant—I am quite positive he was the one that put it on—the mileage, and also had him make a notation of the type of pistons that was in the car on this bill of sale. I made this notation on the back myself. I saw the notations put on the front of that bill of sale; I gave him the information and he put it on there in my presence, and I took the bill of sale. I was under the impression it was Randall, at first, but I don't think that way now; I am quite sure it was his assistant. Randall told me himself he didn't put it on. Quite some time ago I asked him about it; I saw Randall in Milwaukee one day, and I was talking with him about it, and Randall said he didn't remember putting it on. A man by the name of Parlow, his assistant, was the one that put it on, he figured put it on, so I am quite sure Parlow is the man that put it on. I asked Randall about this. It came up over this man Jernegar on here. The car was sold—to make it clear—and I had to take this bill of sale to this attorney Jernegar to see if he couldn't collect

the money from the man that sold the car. He didn't get any, so I had to go after him to get this money. That is what brought up this question.

I put that notation on the back right shortly after this man Cook got the car. Cook had received the car; he had it about a day and I found out I couldn't get my money out of this man who sold it to him, so I went to the car, got the mileage and made this notation and took it to Jernegar. Jernegar was an attorney in Mishawaka.

I received that bill of sale on the day that the pistons were completed in the car, late in the afternoon; the pistons and the top were both completed the same day. The order was given for the car four or five weeks prior; the car was in my possession; I was driving it without a top; that is how the 816 miles got on there. But I wouldn't accept the bill of sale until the car was complete, and the bill of sale couldn't be made out until the top was on the car. The Buda pistons were in that car up to that mileage, 816. I had bought the car before that. It was turned over to me and I had driven it nearly four weeks prior to that, but I hadn't accepted the bill of sale until I got the top on it; they couldn't make out the bill of sale as a complete car, specified complete, because there was no top on it.

The man who made that notation on the front of the bill of sale was an office man; I don't suppose he ever saw the car. Naturally, he wouldn't be out in the factory to know about such things, and I told him what was in the car. I knew they were going in the car because of the fact castings were billed in with a lot of other aluminum castings, and they were charged up to me, and that charge had already been made some week or ten days prior to this date, while the castings were being machined up.

Mr. Bruninga: I object to that part in which the witness said he knew they were going to be put in that car, and move it be stricken out.

The Master: Same ruling.

(Narrative continued) I don't suppose the man, when he made that notation on that bill, absolutely knew that those pistons like Exhibit 51 were in that car; probably never saw them.

I paid the Amplex Company for those pistons myself. When the pistons came in they were billed to me

and they were charged to my account. They owed me about $900 and they were charged off. They were paid for possibly ten days prior to the receipt of this bill of sale. I have no record of it now.

Referring now to the blueprint, Exhibit 32, which is the detail of the piston, and blueprint, Exhibit 31, which is the cross section, I gave Mr. Winchester the sketches, Exhibits 36 and 37, the original sketch and description. I observed the making of those drawings and tracings practically every day; I was in the drafting room every day that I was in the city. I don't know as I stood over the draftsmen and saw them put the vertically extending slot, the inclined slot, on the drawing. I know that Winchester laid out the piston, and he put the inclined slot in, and he did the whole thing according to my directions and my explanation and the explanation of the sketches; but when he got the layout down on paper it was traced in by the tracing boy, whoever he was, and that's the way it was finished. But I saw the procedure as it went along. It wasn't necessary for me to stand over Mr. Winchester, inasmuch as he was a practical engineer. I did not see Mr. Winchester put in that inclined slot with his hands, nor did I see Mr. Rockhoff do it; I don't recall that I was standing over him when he put it in. I saw the original drawings after they were finished, and both drawings positively had the inclined slot on there. I won't say about the first one, Exhibit 31; I don't just exactly recall; but if it is in there that is the way the original drawing was made, or they couldn't have made a tracing or print from it.

I am absolutely positive that drawing, Exhibit 32, had that inclined slot.

I am also positive about drawing, Exhibit 31, that it shows the piston and describes this piston, but whether the section exactly shows how the slot was in or not, I couldn't say. It might have been cut through a section where it interfered with the slot; but it is the same piston in 31 as in 32.

(Witness examines Exhibit 31.) No, it does not show in 31, and the way it is cut here and the way it is sectioned in, it does not show it, because it would come on the side. In order to show it he would have to cut it off and sectioned it in different. I suppose that is merely an error in the tracing. It is an error in the tracing, or it would show there, because it is the same distance there and the same distance here. Exhibit 31 should

show a portion of the slot. A half of it would show in Exhibit 31 and the other half wouldn't, no matter which way it would be taken. A half of it would show in there, unless there was an error made in that tracing.

I don't think I made any statement to the effect that Exhibits 31 and 32—the original blue prints—were never out of my possession. There were two blue prints made of Exhibit 32. One blue print that had the description on, that you have there now, was used when we were selling stock, to show our prospective customers what we were trying to build in connection with this engine. The other blue print wasn't marked up, didn't have a description written on it, and I don't know what became of that one. There were two of the prints originally.

The blue print of Exhibit 32, the original they have there was out of my possession at different times. It was in the hands of a party that was trying to sell stock for us. I think Mr. Pulsifer used it for a while, and I think Mr. Atkins used it for a while, and they were also using a section of this engine later on, and they also used those other prints, those of the engine. That's why those views were made first, to give a general idea to a prospect of what we were going to build. Those are the people that had those prints while they were out of my possession, and they came right back into my possession.

I turned Exhibits 31 and 32 over to Mr. Tibbetts personally.

The Patent Office drawings marked A4 and A5, respectively, (having reference to the slide valve motor), referred to in Mr. Tibbetts' letter of March 27, 1916 (Exhibit 52), I presume, very likely refer to the Patent Office applications of the sleeve valve motor, but I don't know just what they refer to. I think Mr. Tibbetts must have been referring to the application on the sleeve valve motor filed by Mr. Pond or Mr. Offield, and this was a photostat of that application. I believe that is what that was, that sleeve valve motor. I think that is what A4 and A5 refer to. I don't know positive, but I believe that is what it refers to. That is my recollection.

I believe the Packard Company were using iron pistons at the time of our negotiations. I had one of their twin sixes at that time, and I know it had gray iron pistons in it. The pistons were not slotted; just plain pistons. I believe the Packard Company were using iron pistons in November 1917, when these negotiations

were closed up, because that is what was in my car, and the ones in my car were not slotted. Those pistons made considerable of a racket; nothing like the big pistons. Pistons down to three and three and a half inches will run a whole lot smoother and quieter than with the five inch. The trouble in the earlier days was with the big pistons.

Q. In Interference No. 49,569, as found in the record on page 2, in reference to a somewhat broader claim in that interference, you made a preliminary statement under oath on the 23d day of August, 1923, that you had conceived the invention on the 25th day of August, 1911; that you first made drawings, which included sketches—unless you understood it to the contrary—on that same day, 25th day of August, 1911, and that on the 25th day of August, 1911, you first made a written description, and that on the 25th day of August, 1911, you first explained the subject matter to others, and that the first reduction to practice—that you first embodied the invention in full size engine which was completed about the 25th day of August, 1911, and successfully operated. Can you tell me how you arrived at those dates at that time? A. No, I don't understand that at all, because I couldn't have driven it at the Elgin races in July, 1911, and did that in August, 1911—unless that is an error there somewhere.

Q. That is the way the preliminary statement reads. That preliminary statement was made after an investigation by you and patent counsel of what you had done on these pistons, isn't that right? A. Well, I can't explain that. I drove the car in July, 1911, with the pistons in it. So I couldn't have put the experimental pistons in in August.

Q. Well, I can understand that, Mr. Gulick, and I can understand why you now take the position that is not a correct date; but you signed such a statement on the 23rd day of August, 1923, which was almost a year after the time that you made that affidavit on November 8, 1922, in Cleveland. Can you tell me whether there was any conference between you and anybody in Cleveland, or anybody that held title to this Gulick application at that time? A. No conference that I remember.

(Narrative continued) There were quite a number of preliminary statements signed on that day, but I don't know whether or not they were simply sent to me for signature. The notary public was John M. Eagle, in

Elkhart. I signed those in Elkhart; they must have been mailed to me from somewhere, but I don't know where.

I had been involved in interferences before. I knew what the thing was about when I was asked to sign, when I conceived and when I disclosed the invention, but I don't understand the dates there in August 1911. That must be an error there somewhere, a misprint, because no such date as that could be in August, 1911, covering that condition or statement; that was the first of disclosures.

Q. It is no misprint, Mr. Gulick, at all; it is the record of the proceedings in the Patent Office, and that is an actual record of your preliminary statement before the Patent Office (handing to witness). A. Yes, I see. Let me read it and see what it says.

(Witness reads pages 2 and 3 of the record in Interference No. 49,569):

"Edward J. Gulick, of Elkhart, County of Elkhart, State of Indiana, being duly sworn, deposes and says he is a party to the above entitled interference, declared by Commissioner of Patents, July 7, 1923, and that he conceived the invention set forth in the declaration of interference on or about the 25th day of August, 1911; that on or about the 25th day of August, 1911, he first made drawings of the invention; that on or about the 25th day of August, 1911, he made the first written description of the invention; that on or about the 25th day of August, 1911, he first explained the invention to others; that he first embodied his invention in full size engine which was completed about the 25th day of August, 1911, and that on the said 25th day of August, 1911, the said engine was first successfully operated in the city of Chicago, county of Cook, state of Illinois, and that thereafter he continued to use same and produced and successfully used one or more additional engines embodying said invention."

(Narrative continued) Well, that is an error there somewhere in August; it is an error of one month. The record shows that I signed the oath, but I don't know how that could have happened, because there is just one month lapse, difference, in error.

Q. The conception date should really be in 1908? A. The conception date is the—I used them in the Excelsior motor—should be 1908. Well, that is referring to this one—51—32—

Mr. Richey: There is some explanation of that on page 43 of the record, where notice was given and application was made to amend the preliminary statement.

Mr. Bruninga: Yes, I understand that, Mr. Richey; I understand application was later on made, and that he corrected himself during the course of the interference proceedings, but what I would like to know is how somebody arrived at that date of August 25th.

Mr. McCoy: There was no application made to amend that preliminary statement, to my knowledge. I think that was allowed to stand. The preliminary statement was in the nature of a pleading. I think that was allowed to stand, because there was no necessity of clearing up back of 1911. The Patent Office ruled the owner of the patent was entitled to rely on a date when the date set up in the preliminary statement would not entitle him to go back of that.

(Narrative continued) I can't explain how the date of the 25th of August, 1911, was arrived at. It should have been July. The date of August 25, 1911, was no critical date at all at that time on the piston used in the Excelsior motor. There were no pistons involved on August 25, 1911. No statements to that effect.

I think I understand the claim in Interference 49,570, reading: "A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with the operable parts for said piston." And also my preliminary statement, reading on page 9 of the record: "Edward J. Gulick, of Elkhart, county of Elkhart, state of Indiana, being duly sworn, deposes and says he is a party to the above entitled interference, declared by the Commissioner of Patents July 7, 1923; that he conceived the invention set forth in the declaration of interference on or about the 25th day of August, 1911; and that on or about the 26th day of August, 1911, he first made drawings of the invention; that on or about the 26th day of August, 1911, he made first written description of the invention; that on or about the 20th day of June, 1914, he first explained the invention to others; that he has not reduced the invention to practice other than by filing of his application Serial No. 204,661 involved in this interference." That statement also was executed on the 22d day of August, 1923, before John M. Eagle, Notary Public, Elkhart, Indiana.

Q. I believe you understand that particular claim relates to the yielding ribs or web structure, and does not contemplate Exhibit 48 and Exhibit 51, which had no yielding webs. So according to your testimony, you say that you were entirely correct in stating that it had not been reduced to practice, that is, an actual piston made and tested prior to the filing of the application? A. That is, speaking of Exhibit 32.

Q. Yes, Exhibit 32. The preliminary statement says over your signature and under oath that you first explained that invention to others on the 20th day of June, 1914, which would correspond to the date of four days prior to Exhibit 32. A. That is with reference to 32 here. Now there may be a mixup in the dates somewhere. I might have got the dates wrong.

Q. You are still sure that you explained the Exhibits 36 and 37, the original sketch and description, to other people before you showed it to Mr. Winchester? A. Yes.

Q. But can you explain how it happens that you stated in your affidavit in 1923, that the first time you explained that thing to others was on the 20th day of June, 1914, which would correspond with the date Mr. Winchester said? A. I can't explain that date of the 20th day of June, because it is not logical to believe a man would take and make that on the 20th day of June until this date right here—he would make it from the 20th to the 24th. So it was explained to Winchester very much prior to that date, and how that date got mixed in that way, I don't know, unless I mixed up the dates in my statement; because Mr. Winchester had that information long prior to that date of June 1914.

Q. Well, you didn't sign these two affidavits, these preliminary statements, without knowing what you were signing, did you? A. Well, I might have got mixed up in the dates there when I signed them.

Q. Yes, but every date is mixed up, isn't it? A. No, not every date.

Q. There is no August 25th date that is critical at all, is there? A. There is no August 25th date critical in which I put pistons in the Excelsior motors.

Q. There is no 20th day of June, 1914, that is critical? A. Well, the 20th day of June date does not correspond with this; but this is correct, and they were in Winchester's hands long prior to this date here of June 24th. But I can't explain how those dates got in there,

unless that was an error on my part when I signed those affidavits.

Q. I wish you would refer to pages 43 and 44 of the Gulick record before the Patent Office, Interference Nos. 49,569-570-571, particularly to answer to Question 20, in which you state with reference to a piston: "Q. 20. Have you any other way of fixing the date of the making of Exhibit 1 than you have named? A. None other except that we made a set of these pistons for a motorcycle motor, which was block-tested, to be used in a racing motor prior to the official opening. Further, the pistons used in this test were of the standard racing type and were to develop the split skirt idea, but were not ribbed exactly as shown in this sketch." Exhibit 1 corresponds to Exhibit 36. When you used the words "not ribbed exactly as shown in this sketch," you really meant they were not ribbed at all, that the motorcycle piston wasn't ribbed at all? A. It wasn't ribbed from the head down.

Q. It was just those little circumferential ribs? A. Circumferential ribs.

Referring to the block test of that motorcycle piston, further along on page 44, where I said: "And as the standard piston for this purpose was not ribbed according to the sketch but the skirt was split, weakened them and they were not put in the races." One of the pistons did fail; one of them bursted through the piston pin hole; but it didn't fail as far as seizing is concerned, or scoring.

In my answer to Q. 131, page 60, I said that I came into possession of the print, Exhibit 9 (which corresponds with Exhibit 32) shortly after it was made, that is, in July, 1914; while on the next page, in my answer to Q. 136, I stated that I received it in June, 1914. June 1914 is the correct date. I gather that from the date on that drawing, and that date there is correct. I fix it by the date on the drawing and not from my own recollection; I couldn't remember the date; but that is correct; that is when it came out, the print was made, and that is made from the tracings. That is the only way I have of fixing that date, and those dates I know are correct; the dates on the tracing are correct.

I didn't disclose the print, Exhibit 32, with the descriptive matter on it, to anybody at Harvey, Illinois. I mailed the Buda Motor Company, of Harvey, Illinois, a print and their engineering department had it, and I don't know who all saw it, who went over it, and I don't

remember the party's signature who returned it to me. It was mailed to the Dodge Motor Company, attention their engineering department, and attention Mr. Place, general manager. I presume likely he must have seen it because it was mailed to his attention. It went to the engineering department, and it was in their hands quite some time. I know I mailed it to that company, and their stamp was on it as receiving it; I have the stamp of the Dodge Company on it; said them I got it back later on. I believe there is a copy of a letter on file from the Dodge Company stating at the time they sent it back. I don't know where that letter is. I think perhaps there is a copy on file with the—I don't know, but there might be a copy on file with those people here.

I wouldn't doubt as long as the print was sent down there, they might want to get a copy. When it was actually returned, the date was on the print when it was returned. I don't know whether I ever turned the letter over to them or not, or whether they ever asked for a copy of the returned letter. I actually saw that letter they sent to me when they sent the print back, but I don't know where that letter is.

As to my statement, on page 62 of the record, in answer to Q. 143: "Did Mr. Pond or Mr. Offield see Exhibit 9? A. They did not" (Exhibit 9 corresponds to Exhibit 33), I don't think that Mr. Pond or Mr. Offield ever saw Exhibit 33, the detail of the piston.

On page 77 of the record I testified as follows: "XQ. 287. If the metal of the ribs were made of such a thickness that the cylinder wall pressure failed to overcome the rib tension, would the piston seize? A. If it were a rib sufficiently heavy that there was absolutely no flexibility in a direction parallel to the piston head the structure would then be in that direction rigid, and if fitted to the cylinder as closely as permitted by the flexible structure, as in the application, it would undoubtedly score on the sides adjacent to the end of the piston rings. However, the split in the skirt between the ribs would afford relief for that portion of the skirt, but could not afford relief for the sides of the piston adjacent to the pin. By this explanation I mean a rigid structure parallel with the piston pin."

That meaning there of a rigid structure parallel with the piston pin means rigid structure of a web running across the top of the piston from boss to boss, as a good many pistons have been made of solid structure. That is what that refers to.

Q. You didn't say anything about flexibility of web to Mr. Tibbetts, did you? A. I don't know what I did say to him.

On page 81 of the record I testified as follows: "XQ. 261. In your answer to XQ. 13 you have stated that in addition to showing and exhibiting Exhibit No. 1, to your wife, you also disclosed it to one or two other parties. Do you now recall who the other parties were? A. They were friends of mine who lived in the immediate neighborhood. XQ. 262. Can you give their names? A. I can give their names, but it don't seem to be warranted: the idea is two of them were women. XQ. 263. What were their names? A. One was Mrs. Smith and the other Mrs. Grubbs. Their husbands also visited my house on numerous occasions and knew of it, but not sufficiently to be able to testify. Q. Two of them—or both of them? A. Yes. Q. Did you disclose Exhibit No. 1 to the husbands of these women? A. I believe I did, yes."

I did show Exhibit 36 to Mr. Smith and also to Mr. Grubb, and I explained it to them. I don't know whether they understood it or not, but I tried to make them understand it.

By the statement: "The husbands also visited my house on numerous occasions and knew of it, but not sufficiently familiar with it to be able to testify," they visited my house and saw the work I was doing, and I doubted very much either one of them would be able to testify as to the details. While they would know of the idea of the split piston, and that's all, they would know—like a lot of other people would know what a split—people see only a split piston—they wouldn't really be able to know, not being technical, what it is—what its function really meant. They understood it was a split piston to keep from seizing, and that is probably all they knew. They understood that the piston of Exhibits 36 and 37 was split, but didn't understand what the function might be.

Q. They didn't understand the web construction, did they?

Mr. Richey: I object to these questions, what somebody else understood. He can testify what he did and tell them about it.

The Master: Proceed with the examination. Answer the question.

The Witness: My impression is they understood it.

(Narrative continued) By the statement on page 81, "but not sufficiently familiar with it to be able to testify," I meant that I believed they understood it was a split skirt piston; but the actual details of the functions of the ribs and various other things, I don't believe they understood and would be able to explain it, and probably if they were to testify all they could say it was a split skirt piston, and what they understood it was supposed to do, and I thought they wouldn't be able to testify.

On page 86, I testified in 1926, in answer to XQ. 253: "In showing it to my wife she was the only one that was familiar, by my explanation, with its construction. The other parties mentioned, being neighbors, saw it, as previously stated, but they were not qualified to understand it. For that reason, in my first answer, I didn't mention them. I had forgotten the circumstances."

My wife thoroughly understood it, and I don't think they, the neighbors, thoroughly understood it, the details; in fact, I know they didn't understand the details, but they did understand it was a split skirt piston. That's the only point I am trying to make. In those answers I was referring not particularly to the women, because I know they would not understand it too well. Probably understood the words "split skirt piston." But the men would understand more what the functions were to be, but not the details.

(Thereupon an adjournment was taken until Thursday, March 16, 1933, at 9:30 o'clock a. m., whereupon the following proceedings were had:)

Mr. Richey: Before we proceed with the witness—I understand he would like to make an explanation of this Watts & Gehr matter and also in connection with those dates in the affidavit. Is that satisfactory to you?

The Master: All right, proceed.

The Witness: The dates stated in the preliminary statements in the interferences were not clear to me, and I didn't quite understand how the d 'es got mixed up the way they were, and not being sure whether it was Mr. Watts or who it was who sent the affidavits in, and I inquired of Mr. McCoy as to who had the case prior to his taking it over, and I learned it was Mr. Gehr. So when I asked Mr. McCoy what became of the correspondence of Gehr, not having any myself I had nothing to refer to, and he

told me the correspondence regarding these affidavits or preliminary statements had been turned over to him; he gave it to me and here it is.

Mr. Bruninga: (After examining correspondence) It seems to me the proper thing is for counsel to examine him on this matter rather than let him go, what I might say, rather wild on hearsay statements.

The Master: Of course if he wants to make a statement he may make it and you can examine him about the statement if you care to.

Mr. Bruninga: I have no objection to this witness clarifying the issue, but it is only this danger of getting so much hearsay into the case.

The Master: I think he can make a statement to correct his testimony if he wishes; if he gets off into hearsay, we will stop him.

Mr. Bruninga: There is one thing I would like to ask right now, because it might be included in his statement, and that is the letter of August 22, 1923, of Mr. Gehr, calls attention to the fact that there was a history dictated by this witness while he was in Cleveland, and I think even in fairness to the witness he ought to see that history because it will be produced some time.

Mr. McCoy: May it please your Honor, we are making search for that history at the present time, and because of the great volume of papers in this mass of material that accumulated during the interference proceedings and so forth, we have been unable to locate that history as yet. I have also phoned Mr. Gehr to look in his files for that history, and we will hear from him.

The Witness: Gehr's letters show that he secured his dates from New York as to the time of the Elgin races, and when the affidavits were sent to me they read "on or about," and I took it for granted that "on or about" gave me quite a range of latitude as far as the date was concerned, and the time being very short in which the affidavit had to be gotten to Washington, only four or five days or whatever it might have been, I, without further question, believing he was correct, signed the affidavits and forwarded them on. And Mr. Gehr's letter covers the whole situation, and my letter to him in which I believe I said there they are as nearly correct as pos-

sible, something to that effect. I believe that about covers the situation about why the dates in these affidavits were given as they were. That is all.

Cross Examination Continued by Mr. Bruninga.

I have read this letter of Mr. Gehr's. I don't have the original. That was not one of the letters that was burned up, not at that time, but I haven't a copy of that letter and I don't know where it is; I haven't the original of that letter, I don't know what became of it.

That letter starts out: "In accordance with my telephone conversation with you this afternoon, I am enclosing herewith preliminary statement." Mr. Gehr must have phoned me, but I don't recall what he phoned me about. I recall the letter. I don't remember what he asked me over the phone. I don't remember what he asked and I don't know positively that he phoned me, I couldn't swear that he did; evidently he did.

This letter also proceeds "the claims in issue are broad enough to read on the pistons which you actually constructed in 1911 and again in 1914." I had told Mr. Gehr about the 1911 and 1914 pistons, but I don't remember of ever giving him a sketch of it, like Exhibit 48. I gave him this sketch, Exhibit 62; this was made in his office. I don't recollect of giving him any other sketches, but I might have. I imagine Mr. Gehr would know.

Mr. Gehr was the gentleman who wrote me the letter and the one that I conducted the conference with. He was the only one that I know of. I was under the impression first that Watts was the man, but because I was mixed up between the three, between Richey, Slough & Watts, and Mr. Gehr, because Mr. Richey having taken the interference testimony and having been here and been in Mr. Gehr's office, I don't know what the connection was, so in remembering the names I had the name of Watts in my mind when I meant Gehr. I didn't go to see Mr. Watts to see if I would recognise him as being one of the parties.

Mr. Richey: I think he is mistaken about that. Mr. Watts was in our office yesterday afternoon when you were there.

The Witness: I don't know if I met him. If I did I didn't recognise him.

(Narrative continued) I don't know who he was if I did meet him.

I have not seen Mr. Gehr since I have been here in Cleveland.

Since Mr. Gehr said in his letter that "the latter form of construction is shown in sketch marked B-1 and which is attached to the history you dictated here in Cleveland," I must have dictated a history, but I had forgotten all about it. I don't remember now if the history was taken, what it contained, if such was dictated, or what it was.

I don't remember what sketch Mr. Gehr is referring to where he says in his letter: "This sketch, I understand, you made some time while you were with the Excelsior Company in Chicago, prior to the Elgin races in 1911, to which you drove the car just then fitted with the slit and split pistons."

(Referring to the letter B-1, marked Exhibit 36.) Evidently Mr. Gehr had B-1 in his possession at that time, and this inquiry referred to the sketch B-1 which was made prior to the Elgin races.

I read that part of Mr. Gehr's letter which reads: "I have named 'on or about August 25, 1911,' as the date for your conception and the drawings (sketch B-1), and I named 'on or about June 20, 1914,' as the date which you disclosed the invention to others. I placed this latter date June 20, 1914, arbitrarily just a few days before June 24, 1914, the date which appears on the drawings made for you at Mishawaka. Doubtless you disclosed this subject matter to the draftsman a few days before he completed and dated the drawing."

In the last paragraph of Mr. Gehr's letter, where he states: "I think I have fixed the dates as accurately as it is possible to do it, but if you find anything seriously wrong, I suggest you telephone me at once upon receipt of this statement. I shall be in Cleveland tomorrow, Thursday, but will be in Detroit all day Friday, and you can reach me there by calling the Arctic Ice Cream Company." I did not phone Mr. Gehr, that I know of; I don't think I did phone him.

Q. But you let that matter stand that you had not disclosed the subject matter of B-1, or sketch B-1, to anyone prior to June 20, 1914, you left that stand in the preliminary statements, although Mr. Gehr particularly called your attention to the fact that he took that to be the date that you must have disclosed that to the draftsman. A. Well, that was the first setting of the date. It was disclosed to the draftsman in 1914 prior to that

date, and that is according to his letter, he didn't know just when I did disclose it, I don't suppose. In his letter there, referring to "on or about," I didn't consider but what there was a range of latitude there that would take any date; it wasn't positively fixed; it may have been one month or two months or three months back.

Q. Did you consider a statement of disclosure of the flexible web construction to others as of June 20, 1914, to be verbally flexible enough to cover 1911? A. I wouldn't say as to such disclosures.

(Narrative continued) In my letter of August 23, 1923, I said: "I am in receipt of your communication and instruction of August 22 covering the interference piston application Serial No. 204,661. Insofar as I can see, they are as correct as could be expected under the circumstances." At that time I felt Mr. Gehr knew what he was doing, what he was talking about; he looked up the dates and I hadn't.

I never had been in an interference before that time, not before the interference in this case, to my knowledge.

Q. Now, think back. You were in the interference of Huff vs. Gulick? A. Oh, I beg pardon, I was in that interference.

There are no others that I know of, that I can recall.

I knew what the purposes of preliminary statements were. I didn't look up the dates on which I was going to rely; I left that to Mr. Gehr. He had the whole matter in hand. I didn't own the patent; that was of no interest to me, if he wanted to establish the dates that way, as long as they were within the range of what I knew was correct, within a reasonable range, I had no objection to signing the affidavits.

If the reasonable range made a difference of three years I would naturally give it some thought, but when it was within a year, and he said "on or about" I didn't make any objection, I don't know what the date was.

Q. But when the preliminary statement specifically set out you disclosed the subject matter of Exhibit B-1, that is Exhibit 36, in 1914, and you actually, as you say now, disclosed it to others as early as 1911, there is quite a discrepancy, isn't there?

Mr. Bruninga: Interference No. 49,570. It states on page 9 of the Gulick record in the interference that "on or about the 20th of June, 1914, he first explained the invention to others."

Mr. Richey: Well, he referred to B-1. There is not any reference to B-1 in there, is there?

Mr. Bruninga: Well, Mr. Richey, you will hardly disagree with me, by looking at the amendment on the opposite side, that that refers to B-1.

Mr. Richey: I want the question to be clear to the witness, it is not what I understand, but what he understands.

Mr. Bruninga: That was all settled yesterday what it related to.

Mr. Richey: If he understood the question it is all right. I want to be certain about that.

(Narrative continued) I take it, by reading Mr. Gehr's letter now, and by reading the claim in Interference 49,570, on page 8 of the Gulick record, and by reading the preliminary statement on page 9 of that record, that that statement in the preliminary statement in interference 49,570 "that on or about the 20th day of June, 1914, he first explained the invention to others" refers to Exhibit 36. However, the dates that he stated in here, I don't know how he arrived at them, I can't undertsand how he arrived at this date of June 20, 1914.

Q. Well, read his letter to refresh your memory on it. You read that letter at that time.

The Master: The question is what you had reference to in your statement?

The Witness: Mr. Gehr says he placed this disclosure arbitrarily. I take it for granted he knew what he was talking about and signed the affidavit accordingly. He was referring to the disclosure of Exhibit 36, as I take it.

(Narrative continued) I presume very likely I told Mr. Gehr that Exhibit 36 had been disclosed to others in 1911, because he had 36 in his possession. I didn't try to correct him on this letter, I didn't write him any letter. I took it he was an attorney and knew what it was about. My letter to him was not to the effect it was all right; I told him as far as I could see it was as correct as could be expected under the circumstances. He was looking up the dates, I had no record of the absolute dates. So I followed his instructions and advice in the matter. He was the attorney for the patent; I had nothing to do with it. It was my idea at that time that the dates were as correct as they could be made under

the circumstances, because as he said "on or about" there was latitude to work in.

I made the statement on page 48 of the Gulick record: "The Exhibits 1 and 2 (Exhibits 36 and 37 in this case) were made prior to the Excelsior plant being turned over to Mr. Schwind, the purchaser, in November, 1911."

On page 62 of that Gulick record, I testified as follows: "Q. 143. Have you been able to think of anything else by which you can identify the time when Exhibit 1 was made by you? A. Yes. Q. 144. Will you state it? A. In making up this sketch, it was the first time that I gave any personal attention to the mechanical features of the motorcycle motor, and as the development of these motors for racing purposes was going on, in sketching up Exhibit 1, I had in mind the general form of the motorcycle piston, and pictured the sketch about the same as the piston used in the motorcycle, that is, as to shape and dimensions. I never did any other work on a motorcycle except to follow it through until the time it was tested, which was some time prior to July 1911."

On page 57 of the record, I testified as follows: "Q. 105. Will you explain why you slitted the pistons like Exhibit 8 and used them instead of making them up like shown in Exhibit 1, in 1911? A. Excelsior Motor Manufacturing Company at that time was in the hands of a creditors' committee for a receivership, and I had instructions from the chairman of the committee to make no expenditures on experimental work for automobile motors, as it was the intention to discontinue the manufacture of automobile motors in event of the receivership being dismissed. Therefore I couldn't make up any special construction. Q. 106. Was the Excelsior plant sold, and if so, when, and to whom? A. The Excelsior plant was sold to a man by the name of Schwind of Chicago, about the 1st of November, 1911, and I turned over the keys to him November the 11th, 1911. Q. 107. When did you leave the employ of the Excelsior Company? A. About one week following the turning over of the keys to Mr. Schwind. Q. 108. Will you give your reasons for putting the standard pistons back into the car after the removal of Exhibit 8 pistons? A. One of the reasons was that it was not a standard piston and could not be sold as such to any Excelsior Motor Company's customers; another was in order that all motors were to be disposed of, and no others were to be manufactured by the Excelsior Company; further, as I, as the inventor of

the idea, I considered it was of value, and as it was designed on my own time, it was my desire to hold it, and, further, I did not know what Mr. Schwind's attitude might be in connection with the motor end of the industry."

Mr. Bruninga: Exhibit 8 corresponds to Exhibit 48.

(Narrative continued) On page 65 of the record, I testified as follows: "Q. 167. Will you explain why the 1914 pistons were made like that illustrated in Exhibit 11 instead of that illustrated in Exhibits 9 and 10? A. The piston as made in Exhibit 11 was made from a standard piston pattern, and the only change was in the inserting of the double ribs, tying the bosses more securely to the piston head. The object in making these pistons was to give them a trial in aluminum, and not go to the expense of making up expensive patterns designed as shown in Exhibit 9, as these pistons were not to be used in the E.J.G. motor, they were installed for test purposes in a six-cylinder Buda motor."

Mr. Bruninga: Exhibit 11 is now Exhibit 62. Exhibits 9 and 10 are now Exhibits 31 and 32.

(Narrative continued) Now going back to the block test of the piston like Exhibit 48, those pistons were put into the motor, right on the block, and then another motor put in a Renault car and I ran that car then for 3,000 miles. The purpose of the block test was primarily to run in the pistons and also ascertain under load and speed if they would function without seizing or scoring, before they were put in the car, before the motor was put in the car, to save time and expense in tearing the motor out of the car if it didn't work perfect. The motor was started right off on its own power. We had no method of belting motors in the new experimental department which was not complete, that is, no method of running them with another motor.

It was quite the usual practice in 1911 to run in a motor on a block, that is detached from the car, before it was put in the car. That run-in period varied anywhere from five or six hours to two days, depending on how the motor felt after they had belted it in or driven it by an electric motor, all depended on how it eased up and if it eased up freely it might be taken off in five or six hours, and if it didn't ease up it might take 24 hours. That was done in 1911 in large motor plants, but

in the experimental department of our plant, which was a new department, we didn't have any facilities to do that. We had a block to run motors on but it was never equipped to belt the motors in, or it was never equipped with a generator, owing to the fact they were going out of the motor business. The main motor testing plant had not been moved into the new plant and in that department they could be run in that way, in the standard form or in the standard way.

The cylinder had been used with other pistons before that time. The piston used in the motor car was a standard piston without slits. The slotted pistons, like Exhibit 48, were ground. They weren't honed. There was no honing done at that time. They were fitted very close, and the motor went under its own power on the block immediately. The motor gave no trouble under the block test. The pistons were a very close fit, much closer than would have been with the standard type piston not split. It was unusual that pistons of any kind should be operated in a motor under its own power, without having been run in. It was not the general practice to do this. The pistons weren't honed those days, and the cylinders being in practically perfect condition in this motor, placing them pistons in there, it was done for the purpose of making a test, right from the start, to determine what effect the split skirt would have. We didn't follow the standard practice as used in other automobile factories. The standard practice was to run the motors either under belt power or motor power instead of under their own power for a period of hours until they would ease off, and this was not run according to standard practice. The pistons were placed in the motor and immediately started off to determine what the results might be.

The standard practice in 1911 was to follow the belt drive of the motor by operation on its own power for from 12 to 24 hours on the block. I followed that part of the practice of having them run under its own power. The test I gave them was enough to prove they weren't seizing or weren't evidencing any scoring. They were simply, the oil pan was taken off and the cylinder walls looked at, but the cylinders weren't removed when they were put in the car.

The practice of the car manufacturer in 1911, after he placed the engine in the chassis, was to give it a road test. It was not our practice in building the motors.

Our practice was to belt the job in, driving the motor for a number of hours until it was properly limbered up and until it was put under its own power, and then the test ranged one to two to three to maybe five hours, all depending on the motor and its ability, and to test it to the final horsepower the motor had to show; it had to show so much horsepower before it was taken off the block and until it reached that point it wasn't ready to go off the block. That showed that there was checks in the pistons or bearings to bring it down, and a motor wouldn't be shipped until it showed on the dynamometer its rated horsepower it was guaranteed to do by the manufacturer. Now, the manufacturer of cars usually put that motor, put it in the chassis and took it out and drove it a short period of time. He didn't spend a lot of money driving it because when this motor was shipped it was ready to go, but he might give it a 25 or 50-mile, or maybe give it a hundred mile—all depending on how it showed on the chassis, and if the motor didn't suit him after driving it a certain time, he would pull it out of the car and if he couldn't make the adjustments on it so as to put it back, the motor would be shipped back to us, that there was something wrong with it, either tight pistons, loose pistons, or something wrong with it, but how far the manufacturer would drive and what he would do, that was entirely up to him, not to us.

It was the job of the manufacturer of the motor not only to run the motor in on the test block, but from his standard first belting, then putting it in under its own power, then running it until it developed its rated horsepower. If it developed no trouble it was ready for the manufacturer of the cars, and his only job was to check up on the motor, because he didn't put it on the test block himself, he simply checked on the motor to find out it was all right to put in the chassis, and then his car was ready for sale.

I know only in a general way what the Packard Motor Company were doing in 1911. The Packard Company built their own motors then, and it was the practice of Packard to run in a motor on the block, put it in the chassis, give it a road run, and if everything was all right the car was ready to be sold.

It might have been Packard's method to road run their cars a couple of hundred miles, but the car manufacturers we sold to weren't of the quality of Packards that they could afford to run them out a couple of hun-

dred or five hundred miles. They depended on us to deliver motors that would run. We weren't building automobiles.

I have no interest whatever in this patent. I sold absolutely all of my interest in 1917.

I have no interest whatsoever in the outcome of these proceedings so far as the validity of the patent is concerned.

The total amount of money I received for the old patents, as well as the piston patents and motor patents, was $2900.00, as indicated in Mr. Tibbetts' letter of March 27, 1916, record page 289-290. That is the only money I have ever received.

I don't remember whether or not I charged for my time in that interference proceeding; I don't think I did. I lived in Elkhart, only 12 miles from there, and I think I simply gave in my time. I was working for another firm at that time. I have no recollection of ever having been paid for my time, in fact, I know I wasn't. I never received anything additional for time, only for traveling expenses.

I have received no compensation for testifying here in Cleveland, and I expect none other than for expenses. I have no understanding about it.

I have no interest in the Cleveland Trust Company whatever.

I had no conferences with counsel or anybody connected with the Cleveland Trust Company before going on the witness stand this time. I saw them and talked with them but there was no conferences about the details of this case. I just talked with them. I talked with Mr. McCoy, and talked with Mr. Bichey. They simply asked me some questions about what I knew, but there were no suggestions offered or nothing about it. The question of extending the reduced diameter of the head down to the top of the slot in the piston, such as Exhibit 48, did not come up in my talks with Mr. McCoy and Mr. Bichey.

Mr. Brumings: Cross examination closed.

(Short recess taken.)

Re-Direct Examination by Mr. McCoy.

Referring to page 53 of the record of the Patent Office interference, I testified as follows as to the relief of the head of the piston made by me in 1911:

"Q. 84. What was the clearance between the slitted pistons and the cylinder walls? A. The head clearance about the rings was made the same as the standard piston, it was about seven thousandths; the skirt clearance was made to fit the cylinder walls as close as it was possible to fit them in dry."

The skirt clearance was made to fit the cylinder walls as close as possible to fit them in dry, before the piston skirts were slitted. That is, the dimensions of the skirt, so far as the slit of that portion of the piston was concerned, was determined by the fit of the piston in the cylinder sleeve before any slits or slots were formed in it. By "the clearance around the rings in the head" I mean that the clearance was standard and the clearance extended down to the slot (using Exhibit 48 as an example).

Referring to that part of the preliminary statement in interference 49,570, appearing on page 9 of the Gulick record, where it states: "that he conceived the invention set forth in the Declaration of Interference on or about the 25th day of August, 1911." I understood that to relate to Exhibit 36. I also understood the following allegation, in that same preliminary statement, to relate to Exhibit 37:

> "That on or about the 25th day of August, 1911, he made the first written description of the invention."

The tests that I described during my cross-examination, related to certain equipment that was common in the industry, and of automobile motors, when I was connected with the Excelsior Motor Company. The relation between testing new parts and standard equipment are two entirely different factors. In the testing of new parts it is usual, if it is on the motor, to first test it on the block to some extent, and then usually put the motor in the chassis and drive a given road test, sufficient to satisfy the engineers as to its ability to function. And such tests sometimes are carried on very shortly, and other times they are carried on to very extended periods until the desired results are reached. They may vary, change, they used to vary the block test; they weren't as good as they are now; block tests were short, not so severe, and they didn't get as much information out of the block test actually as they got out of hard road tests. For instance, the Packard Company

used to take their cars and drive them clear out to the Rocky Mountains, send me out there, and never come back to the factory until they broke down, maybe drive them 50,000 or 100,000 miles. That was road work. Road work develops on experimental work things that are not developed on the test block. Road driving is one of the best developers in the world. Now, that is what takes place in preliminary and experimental work. In the standard chassis testing or standard building of cars, as with Packard as an illustration, they build their own motors, in this case they belted them in, run them without any power for a number of hours. They were very particular because they were high-priced cars. Then they put them on the block and they ran them on the block, and they didn't get the same results and same conditions by block testing those days as they are getting today because they didn't have the equipment, the refined equipment to do it. Then they run the chassis, and run the chassis without any body, loaded them down with weights or sand bags and carried them over the road for 50 or 100 miles, until they were all run down, until the testing of the motor was O.K. That was the standard equipment, no experimental work on those cars at all, that was standard. There are two processes of testing, one is testing for the customer and the other is testing for experimental work.

As to the relationship between experimental tests and break-down tests, it would depend a great deal on what the device was that they were testing. As an illustration, it might be a carburetor, and if they put it on the motor and they were able to set it so it idled perfectly, and run at high speeds perfectly, and done all the intermediate speeds perfectly, it would go out on the road perhaps 50 or 100 miles, and if under driving conditions the engineers believed it was all right, they wouldn't have to drive it a million miles to find out. On the other hand, they might have some mechanical feature in the motor or other part of the car, and they would have to take it and put it through all kinds of tests and driving up hill and down hill, to find out how it would work and how many miles it would stand up. They might put a transmission on the block and run it a million miles on the block, under load, and grind it out and find out what actually happened under load. Those days they didn't do that.

At the time I was connected with Excelsior Motor Company, when they desired to change the design of piston, about all they would do would be to make up a set of pistons, put them in the motor, put them on the block, and run them for a certain number of hours. Then they would inspect them and see if they showed any signs of trouble. If they didn't, they would be put in the chassis, put out on the road and driven at the discretion of the engineers until they accepted it as O.K.

As to the relation of such a test to a test of motors with standard pistons, it wouldn't have any definite relation, because after the subject was definitely settled, that the pistons were all O.K., and O.K.'d by the engineers, all of their clearance and all of the other parts are passed on for production, then that same class of experimental work or indefinite testing wouldn't go on. In standard production that would be subjected merely to the block test and road test and then go to the customer.

The test to prove up the new equipment, the experimental test, is more severe than the test of the standard equipment. The experimental tests were a great deal more severe, with respect to pistons, in 1911, than were the tests of standard equipment. The difference would be that the block test in the standard job would be short, as a rule, and the road test would be what you might call practically nil as far as mileage was concerned, anything from 50 to 150 miles. While in an experimental job the block test might be carried on, and at the same time they might have one or two motors on the road, and one or two motors on the block test run under load, carrying on both developments at the same time, and consequently the tests for experimental work were much more severe because each one of those motors is run for hours for all capacities, and then the road work given, and all the grief they can give them. As a general thing, more of the cars, more of the motors develop more trouble from road driving than they do on the block.

The amount of road driving that would be given such cars under ordinary conditions in the development of a new piston in 1911 would all depend upon the engineers themselves and upon their conclusions. They might drive it a thousand miles and they might drive it two thousand. They might drive it one hundred thousand miles. They might drive them over a period of a year, a practice such as Packard followed. They give them exhaustive times and exhaustive tests; they run them until they were run

out, that is all, until they were perfectly satisfied. Again, lots of other concerns didn't carry their experiments that far. They would put them in, the piston, or any portion of the motor, they would go in and do 3,000 miles on the motor without seizing or scoring or burning out the bearings under good load and driving under normal conditions, that would be considered fairly good by a good many of the manufacturers.

As to [illegible] pistons I tried out in 1911, I considered the tests I made on them on the block was sufficient to show their ability to work, and the test I gave in the car and the amount of mileage that the Excelsior car was driven, was sufficient evidence that the slit idea was all right, but that, however, had nothing to do with the general testing of the piston and its ability to prevent itself from breaking up.

At the conclusion of those tests, I was not ready to market a piston of that character without redesigning it, making it a proper design piston. After it had been redesigned it would then have to be tested out to prove the new design. It would be pretty hard to say whether it would require a lesser or greater degree of testing than I gave these pistons in 1911. It would all depend on how it performed, the rib structure, and so forth, whether that would stand up and not break down, just how it would function under that new design, that would remain to be seen when it was tested out. If it started out and ran a test block down thoroughly and run its mileage on the road for a co[illegible]le of thousand miles, and didn't give any trouble, I would consider it practical and safe to proceed with; but, on the other hand, the way that class of stuff is tested out now, why, it is upon an entirely different basis, the mileage is indefinite and the block tests are indefinite.

The conditions of testing would be the same in 1911 as they were in 1914.

Q. When your 1914 pistons were removed from the Amplex car in 1914, as you have testified, were you satisfied that your tests of those pistons were completed? A. I was satisfied with the tests as far as results of slotting was concerned, but I would not be satisfied with the test of the piston itself or its ability to absolutely stand up indefinitely, from mechanical design, as far as the piston itself was concerned.

(Narrative continued) The tests that I ran in my own car in 1911 were the conventional way of testing pistons at that time.

My method of testing new engine parts in or about 1911 had been with all of the new stuff that came out, it was put in my car, so that it would come under my personal observation, as I did most of that work myself. In other words, I did most of the observation work. And in connection with that, when we were manufacturing cars, why, there would be another set of whatever it might be, or another part put in another test car driven by some of the other drivers. The fact that my car was my own car made no difference as far as testing out the parts were concerned, inasmuch as some of the mechanics in the factory, in fact, quite a good many of them, drove my car more or less, and if something else came out that didn't sound out just right, they took my car and went over it to find out what the trouble was. I couldn't observe all of those things unless I had a car that was under my absolute control all the time.

My reason for permitting my mechanics and factory associates to drive my car was merely as a matter of observation. For instance, they would have to test the brakes and this and that, and every time the car came in, if there was anything new on it, it was up to the mechanics to see what they could find, see what they could see, see what they could observe as to the new devices.

I observed the operation of these pistons in 1911.

My car was driven pretty much all the time by myself; it was also driven some by the mechanic, Engle, and he rode up home with me practically every night from the factory, and all the time I was driving the car I was listening for anything that could go wrong, knowing I had the new pistons in, and the car was checked for overoiling, and checked for excessive heating, fuel consumption, and so forth, as in comparison with the other type of piston. Every day that the car was in my possession and I drove it or was there where I could drive it and put all the mileage on it I could, I always listened to the motor, and every day that it came into the factory Engle always inspected the motor and advised me if he saw anything that was going wrong or discovered anything that was going wrong; and the mileage test that was put on it was all the miles that I could put on it during the period of time in which I drove it.

The test observations I made in 1914 with respect to the aluminum pistons that were installed in the Amplex car at that time, followed along the lines of, you might say, listening in, and in driving to determine whether the pistons were functioning properly or not,

checking the fuel, checking the oil consumption, for overheating, and such, any such matter as might or could, or any such trouble as might develop with the engine, regardless of what it might be. Every time that I drove the car I listened to it; I was always listening to it when I drove it because I was interested in knowing what it would do. Every time the car came in the man that put the pistons in the car inspected it. I don't mean he opened it, he listened to it, and when he would go out to get the car he would give me his version of what he thought was right or wrong. If it was all right he simply said O.K., it was all right, nothing is going wrong. As long as it developed no trouble on the road under driving there was no occasion to tear it down until it had miles enough on it to warrant tearing it down. It is not the general practice to drive a car on the road 200 miles, take it in the shop and tear the motor down. That is not the practice with any manufacturer, because they couldn't do it. It is the practice, however, of allowing their mechanics, their drivers, with some concerns, not all, to drive their test chassis home in the evening, to take their people out with them, drive it over Sunday, Saturday, and such like that, in order to get mileage on their different types I am speaking of, not their stock types, they get mileage on their cars with nothing to pay for but gasoline, there is no expense of labor to piling up that mileage. That is very common, a man can go out and take his family and go where he pleases, or take his friends.

(Short recess taken.)

After considering the affidavits, or preliminary statements, in Interferences 49,569, 49,570, and 49,571, about which I have been examined, Exhibit 36 was made in January, 1911. The descriptive matter attached to the exhibit, marked 37, was made in January, 1911. Those papers, Exhibits 36 and 37, were shown in January, 1911, to my wife and to some others within a period of about 60 days.

Q. When did you explain the invention as to structure and mode of operation appearing in Plaintiff's Exhibits 36 and 37 to others? A. Well, I explained them to my wife in January, 1911, and I explained them to other parties in January, 1911 prior to her leaving for the south.

(Narrative continued) The inspection and study of these preliminary statements does not change my mind as to the facts regarding which I testified.

I made the tests of the motorcycle pistons at the Excelsior Company throughout the month, but it was prior to July, prior to the opening of the Motordrome; and the examination of the affidavit does not change my recollection of those matters. Nor does the examination of the affidavit change my view with respect to the tests run in the Renault car, or of the mtor which was afterwards used in the Renault car. It does not change any of my views with respect to any of the testimony I have given.

I received the original of the letter that Mr. McCoy handed me from his files this morning, dated August 22, 1923, and marked for identification as Plaintiffs' Exhibit 63.

That is my signature to the letter from me to Mr. Ray Stewart Gehr of Cleveland, marked Plaintiffs' Exhibit 64. I wrote that letter to Mr. Gehr on or about the date shown on the face of it. The copy of the letter that was received by me (Exhibit 63) carried no signature, but it came from Gehr's office, and my letter in reply to it was evidence that it came from Gehr himself, and my letter, Plaintiffs' Exhibit 64 is a reply to Plaintiffs' Exhibit 63. Plaintiffs' Exhibit 63, Mr. Gehr's letter to me, is dated August 22, 1923, and my letter to Mr. Gehr is dated August 23, 1923. The preliminary statements came at the same time his letter came. I signed them immediately, wrote this letter, and got them off the same day.

The motors manufactured by the Excelsior Motor Company at the time that I was employed by them were all of the same type, but some of the customers required some changes in their exhaust manifolds, and some required changes in their water manifolds, and some required double-acting pumps instead of the single; and whenever those changes, those minor changes, not in the general construction of the motor, but when those minor changes came into effect, and they were purchased by a different customer, that motor was usually listed as so-and-so's motor. The motors were all one motor as far as motor proper was concerned, one type of motor. For instance, the Vall people, the motors furnished the Vall Company were scheduled for certain equipment, and when the orders came into the fact, why, those were known as Vall motors. When we got out motors for the Mason Company, they would be known as Mason motors. That is to say, they were Excelsior motors with the customer's name simply attached designating whose motor it was.

While I was with the Excelsior Company, the companies who purchased their motors from the Excelsior Company were Stoddard-Dayton, of Dayton, Ohio. (Those were used in what was known as the Stoddard-Dayton car.) They purchased motors in considerable volume. Mason Motor Company of Iowa. Wall Company. And there were a number of other companies that I don't remember the name of, smaller companies.

The applications for patent which I took out when I was with the Amplex Company, were all filed by me, and the attorney's fees for the preparation of those applications were paid for by the Amplex Company at that time, that is, prior to the first receivership and prior to the time of my leaving them in 1910; and none after that. I left the Amplex Company in 1910.

The Amplex Company paid for all of the patent applications and for the patents, and the whole thing complete, for all the patents that I took out while I was with them up until the time I left them in September, 1910.

None of my inventions, from 1910 down to the present time, were handled in the above manner, relating to automotive parts, but all of my patents in connection with the musical instrument industry were handled in the same way, and that has nothing to do with the automotive industry. I might say the only difference between the two connections, the one and the other, between the Amplex and the Conn, the musical instrument end of it, I had an agreement in case the company became insolvent all patents were to revert to me, in the case of the Amplex Company. In the case of the Conn Company everything was assigned to the Conn Company, as I took it out, and they paid for it.

I entered the employ of C. G. Conn, Ltd. the latter part, I think it was about December, 1915, but I didn't become active in the factory until 1916 owing to the fact that there was a strike on there at that time and they didn't want me to step in, get mixed in the situation until the strike was settled. I remained with them until two years ago this fall.

I did not pay much attention to the automotive industry generally during the time I was connected with the Conn Company, only what I read in automotive papers and Patent Office journals.

As to the cover on Exhibits 36 and 37, I have given this matter more thought since my casual inspection of that cover yesterday, and have this to say: When I de-

livered it to the Packard Company it was in a cover practically the same in color and appearance as this one, as this folder. My recollection is clear on the subject now, it was pinned together with a pin in this way, it was pinned together with a brass paper clip, that is the Exhibits 36 and 37 were clipped together with a brass clip, and they were placed in the folder and when delivered to the Packard Company with blueprint—that would be Exhibit 32—Exhibit 32 was also in the folder but not attached; neither was the 36 or 37 attached to the folder, but they were held together with an ordinary paper clip, one of the wire paper clips over the edge. I was deceived in this situation yesterday, it has been so long since I seen it, my memory wasn't as clear as it might be, but in thinking it over I discovered the situation and the deception. I was very much surprised at that part of it.

I was testing new devices and equipment from 1905 until 1910 with the Amplex Motor Car Company, both in my own car and in company cars, and then in 1911 with the Excelsior Company, up until the fall of 1911, and then not again in my car, anything special, until 1914 with the Amplex Company, and since my separation with the Amplex Company I have still been continuing the tests. I made such tests during the period of my connection with the Amplex Company in my personal car.

Mr. McCoy: That is all. Re-direct examination closed.

Re-Cross Examination by Mr. Brunings.

I read the Patent Office journals after I became connected with the Conn Company. I paid no particular attention to piston patents that were being issued. Nor did I pay particular attention to automotive parts in general. I, of course, looked them over. I was more particularly interested then in the musical industry because that was my business.

I followed motors in Patent Office journals in general because in reading them over I am interested in everything mechanical that I saw that appealed to me.

I have an independent recollection of receiving the letter, Exhibit 63, from Mr. Gehr, because I received Mr. Gehr's letter at the time that I received the affidavits. I remember distinctly of receiving them and signing them and of writing my reply to them. I know I received the letter in connection with the affidavits. I don't know that I received those prints, but I am positive I received the

original of that letter, Exhibit 63. Since I have had occasion to read this I can recall very clearly his letter.

Exhibits 36 and 37 were attached together by a brass clip that goes over the edge and closes down with little spurs on it. That was attached to the top. I believe it was attached to the top, in the upper corner. I believe it was the upper left-hand corner. It could be readily separated, but it wasn't separated while it was in my possession. Neither Exhibit 36 nor 37 were clipped to the folder; they were not attached to the folder solid; they were loose in the folder.

Referring to Exhibit 48, and assuming that the reduction in diameter of the head goes right down to the slot, that would not show if it was only a few thousandths of an inch. It would show opposite the slot if Exhibit 48 was ground perfectly, but 48 isn't a representative job, 48 is merely to show the slotting, 48 isn't ground to no particular size that I know of. I don't know that Exhibit 48 shows that the skirt part below the slot is of larger diameter than the skirt part above the slot. I didn't grind this piston, I don't know how much it is ground, but it shows no evidence of it. If that had been a fact, there would be a ridge showing around the piston on the side opposite the slot, but it was not ground; it was not machined to show that purpose, it was machined to show the slotting idea.

Exhibit 48 was the piston that was before me during the taking of the testimony in the interference proceedings in 1926.

As I understand it, the preliminary statement, on page 9 of the record, interferences 49,569-570 and 571, related to Exhibits 36 and 37. I gather that from the fact that it is stated that "he has not reduced the invention to practice other than by filing his application."

The statement in the preliminary statement on pages 2 and 3 in interference 49,569:

> "he first embodied his invention in a full sized engine which was completed about the 25th day of August, 1911, and that on said 25th day of August, 1911, the said engine was first successfully operated at the city of Chicago, County of Cook, and State of Illinois, and that he thereafter continued to use the same and produced and successfully used one or more additional engines embodying said invention"

relates to the piston like Exhibit 48 that I tried out in the Renault car in 1911; and the date of the 25th day of

August was gathered from the fact that that engine was run over to the Elgin races.

The statement that the car was driven to the Elgin races is correct, and I am not absolutely sure whether the 25th day of August or the 25th day of July was the Elgin races, I am not clear on that matter yet, but if, in case the Elgin race was in July and the car was driven there, it would be reasonable to believe that the car was being driven with those pistons on the 25th day of August.

On the date of the Elgin races those pistons, like Exhibit 48, were first successfully operated in the car. It was successful as far as the slotting was concerned, not as far as other elements, mechanical elements, was concerned at that time. The piston worked satisfactorily, perfectly satisfactory; there was no trouble with it. It worked to my satisfaction on the day of that Elgin race, and it worked to my satisfaction when it was run in on the test block before that time.

It is a fact that, as I said in my affidavit, on page 3, "that he thereafter continued to use the same." By that I mean that I continued to use it in that Renault car until November of that year, after I had found it successful.

On page 2 of the record, the preliminary statement in interference 49,469 covers virtually two constructions for two pistons, it relates to the piston that was used in the Renault test car and it also refers to Exhibits 36 and 37; it is a sort of a double reference in there. That is the way it is, because the piston of Exhibit 36 was not built, but the one that was in the car that is being explained here was the one which was in the Renault car, which was Exhibit 48.

The August 25th, 1911 piston, Exhibit 48, was connected up with the Elgin races in Mr. Gehr's letter. I can't say that I understood that thoroughly at the time I signed this preliminary statement, because from Gehr's letter and from these affidavits that he sent in, as previously explained, I expected he knew what he was talking about and there was a lot of leeway, as to date only; I took it when the statement read "on or about" I took it for granted there was leeway enough in there to work, and I supposed at the time that he was sure of his date of the Elgin races. I took the 25th day of August to be the Elgin races, and when I said "about" that it would be around that time, because it was on the day of

the Elgin races that the piston like Exhibit 48 was actually put in a car and run for any distance.

As to the statement in the preliminary statement, on pages 2 and 3 of the record,

> "and that on said 25th day of August the said engine was successfully operated at the City of Chicago, County of Cook, State of Illinois"

I can't interpret it as referring only to piston Exhibit 48. The one portion of the statement, to my mind, refers to the Exhibit 36 as the invention, and the other portion of the statement, the testing it in the car, to my way of looking at it, refers to the 48 which was being run as a test piston; that is the only way I can interpret it. The latter part of the statement refers only to the test pistons in the Renault car, but in the prior part it refers to the invention proper, which was related to 36 in my mind. Exhibit 36 was the invention proper, and the split skirt idea was also incorporated in 48, but not designed as 36. I considered 48 as part of my invention, owing to the fact it was slotted, but not as to design of ribs, etc.

Referring to page 33 of the same record, the preliminary statement in interference 49,588, I understand what is meant by the following claim, and I understood what the operation would be of that construction at the time the preliminary statement was signed by me:

> "A one piece piston provided with a solid end portion and a skirt portion, said skirt portion having a longitudinally extending slot formed through the thickness of its wall, said slot extending from the rear edge of the skirt portion and forming adjacent disconnected portions in said skirt portion which are capable of being moved inwardly or outwardly without restraint."

That preliminary statement reads as follows: "Edward J. Gulick, of Elkhart, in the County of Elkhart, State of Indiana, being duly sworn, deposes and says that he is a party to the above entitled interference declared by the Commissioner of Patents, July 7th, 1923; that he conceived the invention set forth in the declaration of interference on or about the 25th day of August, 1911, or first made drawings of the invention; that on or about the 25th day of August, 1911, he made the first written description of the invention; that on or about the 25th day of August, 1911, he first explained the invention

to others; that he has embodied his invention in a full sized engine, which was completed about the 25th day of August, 1911; that on the said 25th day of August, 1911, the said engine was first successfully operated at the City of Chicago, County of Cook, in the State of Illinois, and that he thereafter continued to use the same, and produced and successfully used one or more additional engines embodying said invention."

That preliminary statement is signed on the 23d day of August, 1923, before John M. Engle, notary public.

To my mind there are two references in the above statement, one reference is to the original invention, 36, and the other reference is to 48, which was driven in the car. That, to my mind and to my way of interpreting that statement, that is what he refers to.

The portion of the above statement reading: "that he first embodied his invention in a full sized engine which was completed about the 25th day of August, 1911; that on the said 25th day of August, 1911, the said engine was first successfully operated at the city of Chicago, county of Cook, in the State of Illinois," refers only to piston, Exhibit 48, and it is correct where it says: "and that he thereafter continued to use the same." That means that I continued to use piston 48 for the balance of the 3,000 miles.

The first that pistons like Exhibit 48 were driven in the car was to the Elgin races in 1911. I don't know how far it is from Chicago to Elgin, but I should say it would be around 60 or 65 miles—about 120; possibly driven that day 150 miles. That piston was given approximately 150 miles test; it stood up and gave perfect satisfaction in that test.

I didn't tear the engine down when it got back to the factory, but I listened to it and it was operating perfectly. I knew from my experience whether it was scoring the cylinder, by listening, and whether or not it was slapping. That piston operated perfectly during those 150 miles. That is why I said in my preliminary statement that it was successfully operated. And therefore, I continued to use it for the balance of 3,000 miles in that Renault car up until November, after that successful operation.

The preliminary statement, on page 3, and repeated on page 33, stating: "and that he thereafter continued to use the same and produced and successfully used one or more additional engines embodying said invention," (after referring to records) has reference to piston 48.

The "additional" engine means the second engine which had pistons in the same as 48, the second engine that was run on the test block, not in the Renault, but the second engine run on the test block, is what that refers to, which had pistons the same as 48. There were two engines, one in the Renault and one on the test block.

In 1914 I put aluminum pistons like Exhibit 51, in an Amplex car, embodying the same idea as 48, as far as splitting is concerned but not as far as slotting around the top is concerned. The slotting around the top was simply continued all the way around. I had extra ribs on the inside. That was an additional test of pistons. Those pistons were never on a test block. They were put right into the car, were used right off the bat, just about like they run them off the line in the Chevrolet and Ford plants today. I was satisfied that they would work, if aluminum would work at all.

(Thereupon, adjournment was taken to 1:30 P. M. of the same day.)

(Thereupon, at 1:30 P. M., Thursday, March 16, 1933, the hearing was resumed.)

(Narrative continued) Referring to page 33 of the Patent Office record, where it says that I produced and successfully used one or more additional engines incorporating the said invention, that additional engine was a second Excelsior motor. That motor was not put in the Renault car. The second engine didn't have the 1914 construction; that is the Excelsior motor didn't have it. But in the 1914 Amplex engine I also had pistons like Exhibit 51, and that piston had no flexible webs.

Q. And that would then be a piston which was defined by the claim on page 32? You only have to answer if you understand what that claim means; I am not asking you to interpret it.

Mr. Richey: Well, I object to the question. I think that is just exactly what you are doing, asking him to interpret the claim. That is for the court.

The Master: He may answer and you may have your exception.

A. That would refer more nearly to—it is my opinion, I expect that refers either to 36 or 32. I do not think that claim referred to either 48 or 51 as far as the flexible arms are concerned.

Q. Do you find any flexible arms in that claim?

Mr. Richey: Same objection.

The Master: Same ruling. You may answer that by yes or no.

A. No.

(Narrative continued) I don't remember what kind of structure that preliminary statement related to, but I am under the impression that it means 48. The preliminary statement would have reference to 51 also, because neither 48 nor 51 had flexible arms. I probably interpreted the preliminary statement as having reference to both Exhibit 48 construction, which was used in the 1911 car, and the Exhibit 51 construction, which was used in the 1914 car.

The pistons in the engine of 1914 and 1911 weren't alike. They were sufficiently alike, however, that both of them had the general construction without the flexible webs.

I knew that those aluminum pistons weren't left in my 1914 car, because I saw them in the shop when I came back from the East in November. I did not see them taken out of the car, but I saw them on the floor after they were taken out of the car, and I saw them the 11th day of November. That was the last day I was ever in that shop. I left the pistons under the bench, on a shelf. And that was on the 11th day of November, 1914, the day of the receivership.

I know that the cast iron pistons like Exhibit 48 weren't left in the car in 1911 because I saw them after they were taken out. Those pistons were thrown in a pile in a corner where there was some scrap iron. That was a scrap pile.

Both the 1911 Renault and the 1914 Amplex car had been run for some time with other pistons before my split pistons were put into those cars. I don't know how long the Renault car had been run, but it had been run two or three thousand miles. The motor that was in the Renault car was a comparatively new motor which hadn't been run but possibly 500 or 1000 miles, and the cylinders were in good condition.

The cylinders on the Amplex car in 1914 had had about 600 miles of service, and they were in pretty good condition.

It would be pretty hard to tell what might take place with pistons in a motor. Pistons put in a car like that and tested out when first run on the block or even

put in the car and run, may run indefinitely, they may run for years, never give any trouble, or one of them might give trouble in the first 50 or 100 miles; there is nothing to go by on that.

So far as testing is concerned, if the slot of a piston was inoperative and there was any inclination to seize, it would show up in a very few hundred miles; it might show up in the first 100 or might not show up in two or three hundred; but if there was any inclination to seize or score, it would sooner or later develop. It would not develop after fifteen or twenty thousand miles, unless it was out of oil; it would develop in its early history, in its early operation. If it didn't develop within four or five hundred miles, it never would develop, unless it was dry of oil. If it didn't develop in 500 miles, it may or may never develop unless there was some abuse. A good many of those things happen and you don't know the cause or reason for it. Many of those things happen to a piston going wrong when there is plenty of oil in the engine, and there is no accounting for it, but in the case of this split piston, that didn't happen in either one of the tests. The split piston, when it was put in and tested out on the block, and driven in the engine, that was merely a preliminary road work test, but was in no way conclusive of what might happen in the future. The piston was not mechanically designed to be split up in that form, and it was merely a test of what the slotted idea would do. That test was run; when I returned from Elgin I was satisfied as far as the slotting idea was concerned. No engineer would have been satisfied with the structural design. And the test was continued to see what would happen to the slotted idea only, and not the structural design; and something did happen.

After the Elgin test I was sufficiently satisfied to tell the Patent Office in my preliminary statement that it had been successfully tested as far as the slotting idea was concerned. It had been successfully tested up to that time. That is as far as it had gone. As far as the principle of operation, it had been successfully tested up to that time, and further on from that time the tests were conducted up to November, and it operated with one exception, when one of the pistons gave way through the piston, a breakage that was not due to the splitting of the piston in any form except the weakness of the piston; was not due to scoring or seizing.

That Renault car had four cylinders. The other three pistons were operated in the car until we finally

took them out. The piston we replaced went on through, but that was just merely good luck as far as mechanical structure was concerned, had nothing to do with the splitting whatever; all the splitting did was to show what it would do as against seizing and scoring, see what would happen; and it did; that piston, '48, could not be made as a commercial proposition.

I don't know as I could enumerate where all the car was driven in 1911. I drove it around Chicago, out in the country various places around South Bend all the spare time I had, evenings and such like I was driving the car because I wanted it under constant observation so as to know just exactly what the pistons were going to do, how they were going to finally wind up and work out as far as the split was concerned. I was not interested in anything else in the piston.

The engine was opened up when the crankshaft broke and the pistons could be removed from the bottom, but the pistons weren't pulled out until the broken one, but the motor was turned over after the shaft was put in, they were shoved up in, and you could see the walls were in perfect condition. I saw the motor when the broken piston was taken out and when the new crankshaft was put in, and I couldn't say whether Engle pulled the pistons all out himself and shoved them back or not; but they were in the motor when I saw it; they were all in the motor when I saw it. Then later on when the piston broke, all the other pistons weren't removed, simply one piston put in its place. It is very easy for any one to observe by shoving the piston to the top; if there is any scoring or seizing, it will show on the cylinder wall.

I paid for the gasoline on that trip with Mr. Williamson. The company didn't furnish the gasoline for anybody. I had to furnish the gasoline for all the driving in the test work. The company wouldn't furnish gasoline for anything. It was the company's car; I used it only for this test purpose. It was just a matter of courtesy for me to the company. I had to furnish the gas and oil, or I couldn't have completed the test. The company furnished the car. It was merely a matter of courtesy. I was factory manager, and as long as I was there I could drive it and do as I pleased with it as long as I paid for it.

I don't know as I took any extraordinarily big trips in 1914 with the Ampler car having the aluminum pistons. Lots of Saturdays and Sundays I drove 150 or

200 miles, from Michigan, around various places. I was interested in putting all the miles I could put on it to find out what it could do. I couldn't afford to hire a man to drive it all day as a test proposition; so I had to drive it myself as much as I could. Some of my mechanics went with me on a number of occasions. The boy that put the pistons in the car was with me. A man by the name of Moran, who was in our factory driving test cars, was with me; different ones in the factory were with me. I think Randall was in it, and he also drove it to see how the pistons operated; and different ones connected with the company. At other times there may have been other people that rode with me. There is nothing to prevent that; that is common practice with all automobile factories.

I had no neighbors at that time, I was a single man.

I did not drive the car for pleasure, if you want to call it pleasure; you can call it anything you like. I drove the car back and forth. I lived in Elkhart, part of the time in Mishawaka, and I drove it mornings and nights. Or if I had to go down town. I drove it evenings. The primary object of that driving was to get my money back; it wasn't because I wanted to own the car; and the second object was to test the pistons thoroughly. I put all the mileage on it I could, and I spent all my available time testing it, and having many employees of the factory observe to see how it worked, and they observed the results every day that the car was in the factory, but not used for a private proposition for transporting people or joy rides, or anything of the sort; but it was my privilege if anybody wanted to go in the car and ride, it was my privilege to let them get in; it wasn't a public conveyance or public vehicle for transportation. I spent my Saturdays and Sundays going out into the country on trips in order to put mileage on the car. I had no other time to put it on.

My sole object in life was to determine what I was going to do with the business. I certainly had to do it on Saturdays and Sundays; I certainly wouldn't go out on Sundays and run around the block to put mileage on the car. I did the same as Studebaker or Packard; they let their employees and engineers take a car and drive it over Sunday wherever they pleased; it means nothing where they do it. The same companies, Studebaker and Packard, permit their engineers to own their own cars, and if that engineer wants to put devices on that car, he has the privilege to do so, but still those devices belong

to the Studebaker or Packard, and he has them on the car, but he drives it for pleasure and everything else, and to make observations, he has it under his observation, or otherwise the engineer has nothing under his observation and there is no other way he can do it, whether it is his car or the company's car. Nearly all the engineers own their own cars.

There was absolutely nothing else but the piston on that car to be tried out. The rest of the car was an old tried-out proposition.

I did not measure those pistons with micrometers after they had been taken out. I was interested in the wear, but I had no opportunity. If I could have carried it on, got the plant back and gone into it and gone to work after the 11th day of November, I would have known all about it.

There were a few who tested the pistons with a micrometer to see how much the wear had been, and a lot that didn't at that time. Most all concerns, the majority of them, took a good big guess by looking at it, and if it didn't score or seize, it was said to be O.K. That is about all the micrometer that was used in those days on pistons. That wasn't my idea, but that is the way it was done. I might explain to you for your benefit, though, on lots of occasions the pistons came off the test block or also came off the test car when the engine was loggy and the driver could tell very easily that the pistons were some times too tight from two conditions; the engine was loggy and the engine het up. Now, that engine would be brought in to us and the pistons pulled out to determine which piston was making the trouble. Possibly none of the four pistons had scored yet, but they would be slightly marred, blue spots, or high spots in places. The only thing that was required to fix that was to take a file and make a light brush over the high spots and put the pistons back in again and the job would go on and perform very nicely and eliminate those two or three particular troubles. That is the way the piston worked, that is the way they did.

It was not our idea to take the micrometer and test how much wear had been on the pistons, because of the fact that after the piston had been in the car and been in the test block for 24 hours or 12 hours and then put in the car and came out of the car, and if you took out the micrometer and run it over it, you couldn't tell whether round or square, because it was never round, it was always out of round, always being out of round

you had to make a guess calculation as to just exactly how big it was. If every one of those pistons was positively miked before it was put in the car and a record made of them, all well and good; but they didn't do it those days, they don't do it these days. They do mike them very closely these days. We fitted them those days with a feeler, very similar to what they do these days. The cylinders weren't always the same size, they would vary from three to ten thousandths in the bore, because they were rough-bored, they had to be ground. They weren't all round, they weren't all the same diameter. The pistons were fitted according to the bore with a feeler. We didn't measure the size of the piston clearance because the pistons might be distorted in various directions because of the cylinders not being perfectly heat-treated. The result was that when you took it out even if you did use the micrometer, you didn't know what was wrong any more than you did without one.

I never miked the aluminum piston in 1914. It was miked when it went in. They had to measure the cylinder, mike up the pistons to get a close fit. It wasn't miked when it was taken out. Miking when you take it out doesn't mean a solitary thing, if they are out of round eight or ten thousandths, and there is not a piston made that does not distort, go out of round, not one even to this day.

Q. All you really did was to look at them after they had been taken out, those aluminum pistons?

Mr. Richey: That is not a fair question. He has told what he did. He said a good many more things, and now he is asking the same thing over again, and I object to it.

The Master: Yes; that will be sustained.

(Narrative continued) I didn't make any piston tests before 1911. Pardon me, I was thinking of split pistons. The tests of pistons that were made prior to 1911 were all in two-cycle motors. There were several hundred motors made, but the piston tests when once set as a standard for the year's production, was scarcely ever disturbed after that. Whenever there was a new bore developed or new type piston developed, which was only on two occasions in the history of the business, then of course that piston had to be tested out; after that the pistons were only tested in the engines as a commercial proposition; they were never on the block. Once de-

veloped, that was the end of it for that season's production, because there was only one size of engine made, one size piston.

When I said that pistons like Exhibit 48 weren't ready for the market in 1911, after I took them out, I meant they weren't ready mechanically. The slitting and slotting idea was proved to be good, but the mechanical construction of the piston would suit nobody, no engineer; that wasn't a marketable proposition. What I wanted was the flexible web construction. I wanted a piston engineered up to date as it ought to be to carry out all these ideas. That piston was absolutely no good as far as a marketable piston was concerned; yet it did prove out the slotting idea; that is all I asked of it. That is also true of the 1914 piston, a matter of proving it from an experimental standpoint. The web construction was Exhibit 32, and Exhibit 36 was to my mind the ideal construction. That is what would have been put out if it had been carried through. The Exhibit 48 construction is just merely a by-pass or subterfuge to find out what the slotting would do.

Mr. Bruninga: Re-cross examination closed.

Re-Direct Examination by Mr. McCoy.

Q. Were the claims that appear in the record of interferences 49,569, 49,570, and 49,571 under the heading: "The count of the interference" before you at the time you signed these various preliminary statements, if you recall, as shown on pages 1, 8 and 32?

Mr. Bruninga: Before the witness answers that question, I would like to call your attention to page 52 of the File Wrapper and contents which distinctly says: "Copy to said applicant and assignee." I may say it is the practice of the Patent Office to send these copies of these claims in these interferences direct to the applicant.

Mr. Richey: And the applicant sends them to his attorney, and that is about it.

Mr. Bruninga: I am not objecting to the question. I just want Mr. Gulick to understand it.

The Witness: I don't recall that it was.

Mr. McCoy: Examination closed.

Re-Cross Examination by Mr. Bruninga.

I have read this record of interferences 49,569, 49,570, and 49,571, but this count of interference I don't recall of ever having been brought to my attention or ever having seen it in any form except as I see it in this book.

Mr. Bruninga: That is all. Before Mr. Gulick leaves, have you found that history Mr. Gulick dictated?

Mr. McCoy: We haven't found it yet.

Mr. Bruninga: I would like to have you produce it as soon as you find it.

Mr. McCoy: I shall do it. There are so many papers, in fact we have had a great stack of these interferences going on for a long time. Certain of those papers were turned over to me, certain of them were retained by Mr. Gehr in his files. I looked as thoroughly as I could last night and Mr. Gehr looked some last night, and he is looking today.

Mr. Bruninga: Is he in town?

Mr. McCoy: Yes, he is. He is going to call me if he finds those papers.

Mr. Bruninga: I might want to recall this witness for cross examination if that history is located; I didn't know until today that there was such a history.

(Short recess taken.)

Mr. McCoy: Mr. Gehr says that that original statement dictated by Mr. Gulick in his office was attached to this paper that appears in the record as Plaintiffs' Exhibit 62, the sketch, and that he cannot account for it; he has not got it in his records; he has searched very carefully for it; and my office has searched very carefully for it; so we just don't know where it is.

The Master: Anything further about this statement or this history?

Mr. McCoy: No, your Honor; I don't know any way to account for the loss of that paper except it was not important, no one regarded it as important after the testimony was taken in the interferences. I don't personally remember it. Do you, Mr. Richey?

Mr. Richey: We have made a thorough search for it and can't find it.

Mr. Bruninga: That is all there is to it.

(Thereupon the witness testified as follows in answer to questions by the Master.)

At the time I was operating this Renault car in 1911, I owned a Packard which I bought about the middle of 1911. My wife drove that mostly, and I drove the Renault car. In 1914 I was driving only the one car; I had no other car; and I had no wife then; I was single.

The affidavit which appears in the File Wrapper at pages 27 and 28, under date of December 2, 1921, reading:

"That said invention was incorporated in an automobile engine and successfully used in the United States prior to the month of October, 1915."

might refer to this piston here that was used in the Amplex car in 1914. It could refer to some other use; I would say, the way it reads there it could also refer to 48, because that was prior, too. It could refer to the use in the car of 1911. The only other use was on the test motor. It was never driven on the road except in those two cars. Those are the only uses in the cars and on the road tests.

The Master: Anything further?

Mr. McCoy: Examination closed.

Mr. Richey: There have been so many references to Mr. Gulick's testimony in the interferences that I am going to offer in evidence his entire testimony in that case.

Mr. Bruninga: You mean his deposition?

Mr. Richey: Gulick deposition.

Mr. Bruninga: Yes, I have no objection if you limit it to the Gulick deposition.

Mr. Richey: It occurs at pages 528 to 591 of the record in the Court of Customs & Patent Appeals, and pages 40 to 103 of the Patent Office record, which are the same pages. That has been marked for identification Plaintiffs' Exhibit 1-Z. I offer in evidence this Gulick deposition as Plaintiffs' Exhibit 65 here. I will offer in evidence the pages containing the exhibits referred to by Mr. Gulick, which are in the back of the record. I also offer in evidence the stipulation regarding some of Mr. Gulick's testimony at page 118 of the Patent Office record.

Mr. Bruninga: Let me make my objections as you go along. I have no objection to your offering in evidence pages 40 to 103 of the Gulick record in interferences 49,569-570-571. I have objected to the offer in evidence of the entire record before the Court of Customs & Patent Appeals.

Mr. Richey: Well, we haven't offered that.

Mr. Bruninga: You have marked that for identification.

Mr. Richey: Yes, but we haven't offered it.

Mr. Bruninga: I think that should be separated, if you are going to offer them in evidence, unless you later on can get in the whole record. These particular pages I do not object to at all, because I have quoted from them extensively. I think it might be well to include the preliminary statements in that, too.

Mr. Richey: Well, I won't offer them; they are immaterial.

Mr. Bruninga: I certainly object to the offer in evidence of any stipulation to which I have not been a party, which Mr. Fletcher and Mr. Kingsland and Mr. Gehr signed.

The Master: How can you say that is competent?

Mr. Richey: It would not be competent under this offer. I will offer it later for another reason.

The Master: Very well.

Mr. Richey: You don't object to the exhibits offered, do you?

The Master: If he doesn't object to the testimony, the exhibits would naturally accompany the testimony.

Mr. Bruninga: As far as exhibits are concerned, I would like to look at them. Up to Exhibit 23 I have no objection; although you already have all of those in the record.

Mr. Richey: I don't think there is any use of putting them in; it is duplication. You asked for them.

Mr. Bruninga: I just asked you if you were going to put them in. I think it is not necessary to put the exhibits in. We might readily agree how they correspond to those in the record, and I am perfectly willing you should submit a list up to Exhibit 23.

Mr. Richey: We will leave it that way. Mr. McCoy, will you so prepare a list showing the corresponding numbers in the exhibits, and in the exhibits in this suit? Then we can withdraw these exhibits. That, I understand, concludes Mr. Gulick's testimony. Now, before the defendant closes its case, I say the plaintiff charges that Exhibit 3-O infringes the following claims of the patents in suit: Gulick 1, 4, 15, 25, 33, 34, 36, 42, and 43; Mooers 3, 4, and 11.

Now, do you close your case?

Mr. Bruninga: You haven't given anything except the Gulick patent on that 3-J.

Mr. Richey: In connection with my notice under both 3-J and 3-O, I make the same reservation I did with respect to the others; that is, I don't mean there aren't other patents owned by the plaintiffs, or one of them, that are infringed by these pistons. We didn't know at the time the suit was brought that the defendants were making and selling these pistons that have been brought in here since.

Mr. Bruninga: Do I understand it now 3-O you contend infringes the Gulick and Mooers patents, and those are the only patents in suit?

Mr. Richey: Yes. Of course if there were any others we would charge it.

Mr. Bruninga: As to 3-J you contend that only infringes the Gulick patent?

Mr. Richey: In suit, yes. Now, is your case closed?

Mr. Bruninga: Well, I am still waiting for you to declare yourself as to your position with reference to Exhibits 48 and 51. We had the matter up before we left here the last time. If the Master wants me to briefly review it, I will do it.

Mr. Richey: In other words, his position is that he doesn't propose to close his case until we make an argument on some features of the case. That is most unusual. We will state our position with regard to the evidence when the evidence is all in.

The Master: What is the question that is presented here? I don't know as I got it clearly so as to pass upon it. I don't want to go into the argument of the case. In order to pass upon this question I may have to hear you for a few minutes.

Mr. Bruninga: This is in no sense an argument. In the record, on pages 1324 to 1327 appears the following:

(Thereupon counsel read said portion of the record; also from pages 1336, 1348, 1349, and 1365; and further argument was thereupon had by counsel for the respective parties.)

Mr. Richey: Suppose we take this suggestion: suppose we go ahead with the case; you close your case, and we go ahead with our case; then you will learn about the Schoengarth and these other pistons from the rebuttal testimony; then you will have all the rebuttal testimony of that; then we can take up the questions of surrebuttal.

The Master: Of course that is when it would come up in the normal proceeding.

Mr. Richey: Just so we don't decide it now.

The Master: That is fair enough. I don't want to close the question now because it seems to me, as I see it, there is something to be said for the defendant on this.

Mr. Richey: Let's cross that bridge when we come to it.

The Master: Very well, with that understanding we will proceed.

Mr. Richey: Is your case closed?

Mr. Bruninga: We are just at the point right now, whether technically closed or not, I don't know. The question will come up after you state your position.

Mr. Richey: Then I move that the defendant be required to close his case now.

The Master: It is closed, as I understood, with that reservation.

Mr. Richey: That he make a motion to take surrebuttal.

Mr. Bruninga: The Master can make his ruling.

The Master: I will leave the question open as to the right to take surrebuttal. I think that is what Mr. Richey asked me, not to pass on it now.

Mr. Richey: Then his case in chief is closed, as I understand it.

Mr. Richey: I offer in evidence as Plaintiffs' Exhibit 66 a copy of a Patent Office record, a list of applications of Elmer C. Long filed in the Patent Office.

Mr. Bruninga: What is the purpose of this, Mr. Richey?

Mr. Richey: Why, the same purpose for which you asked Mr. Gulick how many applications he had filed in the Patent Office, with respect to Mr. Long.

Mr. Bruninga: Is this supposed to include all of Mr. Long's applications?

Mr. Richey: As far as we know. I don't know that it includes all.

Mr. Bruninga: I have no objection to offering a thing like this, only the very first check shows the application of December 9, 1918 isn't included.

Mr. Richey: Well, you have to complain to the Patent Office about that. I am offering their record in here. I don't mean to say that it is complete; if we find any others, any evidence of any others, we will offer them, too.

Mr. Bruninga: The only objection I have is that it is not complete. I have no objection to putting it in.

The Master: It will be received.

Mr. Richey: Now, my adversary has offered in evidence Patent Office record including an opinion of one Patent Office tribunal from interference 49,569, and he has also offered in evidence Exhibit 4-L, another Patent Office record which contains reference to interference 49,569; and I am offering in evidence as Plaintiffs' Exhibit 67 further portions of the record in that interference as follows: 67-A, the portions of the record consisting of pages 104 to 281 of the printed record of Gulick, pages 592 to 769 of the court of appeals which was marked for identification Plaintiffs' Exhibit 1-Z, and such exhibits as go therewith that are in the back of the record, and which are not already in this case, but will be covered by the list that will be put in.

The Master: What is that testimony?

Mr. Bruninga: That is testimony of witnesses, your Honor, on which I never cross-examined.

Mr. Richey: Exhibit 47-L contains some of the records of that interference. You put in this opinion of one of the tribunals.

(Thereupon argument was had by counsel for the respective parties, and the question was taken under consideration by the Master.)

Mr. Richey: I offer in evidence as Plaintiffs' Exhibit 67-B, the opinion of the Examiner of Interferences in that case, which occurs at pages 813 to 817 of Plaintiffs' Exhibit 1-Z. As Exhibit 67-C—

Mr. Brumings: I have no objection to the opinions themselves.

Mr. Richey: As 67-C an opinion of the Board, which appears at pages 820 to 822 of Exhibit 1-Z, Board of the Patent Office. As Exhibit 67-D, the opinion of the Court of Patent Appeals in the same case.

Now I offer in evidence the following decisions from interference 49,575; 68-A decision of the Law Examiner; 68-B, decision of the Board; 68-C, decision of the Court of Appeals of the District of Columbia.

I offer in evidence the following decisions from interference 49,570; the full record of which has been marked for identification Plaintiffs' Exhibit 2-Z in this case; as 69-A, the opinion of the Examiner of Interferences appearing at pages 813 to 815 of Exhibit 2-Z; as 69-B, the opinion of the Board, the petition for rehearing, and the opinion of the Board on the petition for rehearing, appearing at pages 817 to 826 of Exhibit 2-Z; and as 69-C, the opinion of the Court of Customs and Patent Appeals in that interference.

Now, in connection with interference 49,571, I offer in evidence as Exhibit 70-A, opinion of the Examiner of Interferences; as 70-B, the opinion of the Board of Appeals in the Patent Office. That case didn't get beyond the Patent Office.

Mr. Brumings: I have no objection to the offer in evidence of Exhibits 67-B, C, and D; 68-A, B, C; 69-A, B, C; 70-A and B. I do repeat my objection to the offer in evidence of 67-A.

(Thereupon short recess taken.)

C. H. Sweet, a witness called in rebuttal by Plaintiffs, being first duly sworn, testified as follows:

Direct Examination by Mr. McCoy.

My name is Charley H. Sweet, and my address is Marion, Iowa. Garage work is what I have been at for a long time, and I have some trucks, operating two trucks besides, but garage is the main business. My business

is located at Marion, Iowa. I am engaged in repair work, automobile repair work. I started in that line of work, well, I went to Kansas City to an automobile school in October, 1914, and came back from there in the latter part of February, along the 1st of April I started to work for Bill Kinney. Before I went to Kansas City to the automobile school I lived at Tipton, Iowa. After I returned to Tipton, Iowa, in February, 1915, I went to work for Bill Kinney. I couldn't tell you where Mr. Kinney is now. I worked for Mr. Kinney from around the 1st of April until in November, sometime in November I got sick and I was off from work then until the latter part of February. Between February and April of 1915 I did nothing until I got the job with Kinney.

The nature of my illness in November, 1915 was, I was working on the car in the snow and got pneumonia from it. I was sick from somewhere in November until the latter part of February 1916, that is, from November, 1915, to February, 1916. I then went back to my job, and the job was gone, he gave it to somebody else, and then I had to wait. I then found a job at Marion, Iowa, the 18th of March, 1916. I moved from Tipton, Iowa, to Marion, Iowa, on the 18th of March, 1916. I place that date by the fact that it was the first time I had been back to that town since to work there, and that is why it stuck in my craw, which is the day I went back there to work, and I never went back to Tipton.

I knew Gustave Monckmeier. I first met him in the fall of 1915 at the fairgrounds race track at Tipton. That was before I had been to school at Kansas City. The circumstances of that meeting were: just like all young fellows, crazy for a race car, and I hung around there and got acquainted with Gus, got talking to him. I knew he was staying at Tipton, and naturally a young fellow will hang around where that stuff is, that is how I got acquainted with him. He had a Stayer race car. It had a No. 9 on it. I didn't pay much attention at that time until later on I got more interested in the car. Being around the garage, I got more acquainted, you know, and then until I went to Kansas City I had been around to the garage quite often, and he was storing it in Kinney's garage and naturally when I had the time I would go up and look the car over. That was before I went to school in Kansas City in 1914. I saw that car after I returned to Tipton in February of 1915, it was there in the garage of Mr. Kinney. The occasion for my seeing

it was I just went in and just looked to see if I couldn't get a job, and the car was setting just around the corner inside of the garage where he stored it. I went in and asked about a job and he said he couldn't give me one, he would as soon as he could. Of course the car was there, stood there in the corner, just like they had left it. I didn't pay any more attention to it then until he got ready to clean it up for the races in the summer.

I got the job from Mr. Kinney. He told me when it opened up he would give it to me. That is the same William Kinney I have spoken of before. There was work done on that car in that garage while I was employed there. I helped on the car; I helped tear it down. The occasion for tearing the car down was he wanted to make the car faster. There was a man by the name of Baker in Davenport had a race car a little faster than he had, and he had beaten him and Monckmeier wanted to make his car a little faster. He thought by tearing it down and overhauling it and by putting in some aluminum pistons he could do it; and that is the way he went at it to try it. I personally ground the bushings after the block came back from Cedar Rapids. The block was taken out and sent to Cedar Rapids to the Faucett Machine Company. They rebored it for a set of aluminum pistons, and had them fitted in the block, and then it came back, and when it came back they bored new bearings. While they were boring the new bearings I ground the valves, and after they got the bearings all fitted and the pistons fitted on the connecting rods, I helped put the block on and bolted it down.

The Faucett Machine Company is located at Cedar Rapids, Iowa. F-a-u-c-e-t-t it is spelled. I was there when the block was taken off from the car. By "block" I mean the part that has the cylinders in it. The block really is the cylinders. There were cast iron pistons in those cylinders. I am sure of that.

Those pistons were just straight cast iron pistons, nothing different to them than any other pistons at that time. They did not have any splits or slits in the skirt. I saw the block when it came back from the Faucett Machine Company. It had been rebored. The aluminum pistons also came with it. These aluminum pistons were just like the old cast iron pistons that were taken out, with the exception they had a concave head, and they were, oh, they had, I should judge the pistons—now it is a long while ago,—I should judge they were pretty close

to a quarter of an inch thick through the skirt, what I mean the skirt, is through here, the bottom of the skirt, looked to be a quarter of an inch through there, they might not have been, I didn't measure them; and there was no oil channels and no oil grooves in those pistons. I am sure of that, and there was no slits in the skirts. Those pistons were put on the connecting rods, when the connecting rods were fitted, they were put on the connecting rods and the block was set down in and it was installed. I helped hold the block up while Mr. Monckmeier put the pistons in the block. The last I saw the pistons, they were hanging on the connecting rods and I saw them going into the block, when they were going into the motor. The motor was then reassembled. The car was taken out to the race track, after it was all ready to go, taken out to the race track and drove, oh, I don't know how long, a couple of days, or three, to loosen it up. It was tight. The bearings, as were all new bearings, were real tight, they had to pull it to start it. I don't know how far they drove it. Of course they towed the car out. They had to tow it back and forth. He drove it, the first race after that was at Anamosa, first race following that was the Anamosa fair. I know that because I was there at the time, I was running the place while Mr. Kinney and Mr. Tracht, his partner, were out to the races. I had to run the place until they came back. I didn't see the Staver No. 9 car that was owned by Mr. Monckmeier at the races, I wasn't there. I seen the car come back. I did not attend the races.

The Master: He had charge of the garage while they attended the races.

The Witness: I know they came back, and one of the boys came back with them and brought a picture of Mr. Tracht sitting on the back of the Staver No. 9 with a piece of bacon in his hand. He was a big fat fellow. I remember that; he came back there; he got the bacon. I remember that distinctly because of the picture hanging around the garage for quite a while.

(Narrative continued) The other persons working at the Kinney garage at the time I was there, were the two partners, Tracht and Mr. Kinney, and Jack Henderson. I mean Everett Tracht, called "Cappy Tracht." He was a partner of Mr. Kinney. I don't believe Mr. Tracht worked on the assembly or disassembly of the

Monckmeier car; he was a vulcanizer, a tire vulcanizer; I don't think he done much on it. Others working on that car besides myself were Kinney and Gus and Jack Henderson; Jack Henderson did the washing of the old parts as they came out, he cleaned up the crankcase, done that kind of work; I don't think he done any work on the car only that, just to wash the parts. And Everett Shipley was riding at the time, and Everett was there, helped on the car, too, but you can't get Everett, he is dead. At that time they all carried a mechanic or assistant, and Everett was riding with him as an assistant.

I know what a split skirt piston is. The first time I ever saw a split skirt piston I thought it was broke. That was in 1921 or '22, I took the piston out of the car, and I thought it was broke. I said to the boys at the time, "The piston is broke," and they said "No, it is sawed for some reason or other." And then we took them out and found they were all that way. That was in 1921 or 1922 at Marion, in my own place of business. I think the car was an Oakland. Ben Butler owned that car at that time.

During the time I was working in Mr. Kinney's garage from April, 1915, until November, 1915, I saw two other sets of aluminum pistons. The circumstances under which I saw those pistons were: "Mary" Jordan—I can't think of what his first name is, they called him "Mary"—at Springville, had a National, and he wanted that rebored and aluminum pistons put in. So he brought it down to Kinney and Kinney made him a price, so they took the car to Fawcett Machine Company and had it rebored and put aluminum pistons in there. After that, after he had run that, he brought it down to Tipton, towed it down to do some work on it, so I saw he had aluminum pistons the same as in Monckmeier. So Kinney went out and talked to Reed Carl to get him talked into putting in new aluminum pistons in his Buick, because Reed was a speed fiend, and it was a 16, I think it was a 16 model Buick, and he wanted more speed, it was a roadster, and he wanted more speed, so they put aluminum pistons in that. Neither of those sets of aluminum pistons put in the Jordan car or the Reed Carl car were split. I saw each set of pistons as they were put in the cars. I couldn't see them after they were in; I saw them as they were put in the car; I know they were put in without being split. I saw the Buick torn down after the original installation, and I saw the Jordan, took his block out. Jordan is a druggist in Springville, Iowa.

He is there now as far as I know. I have an idea the National car in which those pistons were put is junked. The model 16 Buick that Reed Carl had aluminum pistons in is junked. The mechanic that worked with me bought the Reed Carl car and they started to overhaul it, and threw it on the junk heap.

I never saw the iron piston, marked Defendants' Exhibit 3-V, in that shape (after inspecting same); if I saw that piston, it didn't have these holes and it didn't have this here.

Mr. Richey: Referring to the T-slot?

The Witness: This slot here and this slot here and these holes; there was no oil channel in that piston at all (indicating oil channel).

(Narrative continued) The oil goes down, the rings scrape the oil into this, that is an oil channel. There was no slitting; if that piston came out of Monckmeier's car, this wasn't in there (referring to the splits). I am positive of that.

(Witness handed aluminum piston marked Defendants' Exhibit 3-W.) I do not recognize that piston in that shape. This here wasn't here nor that wasn't there, but I do remember Gus stating something about going to take the pistons down and bore holes in here, but whether he done it or not I don't know; but this was not in the piston when it was put in the car. (Indicating the slots.) He might have tore the car down after I had it, that I don't know, but he never done this here. (Indicating the holes in the skirt and also the slitting of the skirt.) I am positive there was no slit in the skirt when we took the car down.

I do not know what this case is about. The first I knew about it was yesterday. I don't know the man's name who saw me, I think his name was Wells, came to me and asked me about it and what I knew about it, and I told him. He asked me if I had done any work on Gus' car. I told him I had, and what nature, and I told him.

Mr. McCoy: Direct examination closed.

Cross Examination by Mr. Brumings.

I didn't know Mr. Wells until yesterday, first time I saw him in my life.

Mr. McCoy: He is Mr. Robert D. Wells, of the firm of Cook & Ballof, Davenport, Iowa.

(Narrative continued) He came over to see me yesterday. The work I did on Monckmeier's car prior to the Anamosa race was in 1915, prior to November, 1915. I know it was prior to November because I got sick in November '15. I started to work for him in April '15.

I do not know what month the Anamosa race was, but I think it was the latter part of September; I can't swear to that because I don't know the exact date of it, but their fair is September, usually have it in September. I couldn't swear exactly to that, but I know the car was fixed up for the Anamosa race.

I came to Tipton to work for Mr. Kinney along the 1st of April. It was somewhere around July and August, after I came to Tipton, that I fixed up that car for the Anamosa race; I can't say the exact month, but that is pretty close to it. I think it was closer to Labor Day than to Decoration Day; I couldn't tell you exactly as to that because we didn't have any races Decoration Day at that time.

Q. You would still say that if I tell you the Anamosa race was on June 10, 1915? A. June 10, 1915? I think I am pretty sure that was built for the races during the fair, whenever that fair was.

(Narrative continued) I do not know if anybody was hurt in that Anamosa race; I wasn't there.

I expect Anamosa is about 30 miles from Tipton.

There could have been two Anamosa races that year, but I don't remember whether there was or not. But that particular race was the one that I remember that Mr. Monckmeier's car was fixed up for. The way I remember that distinctly, because the picture was drawn of Mr. Tracht sitting on the back of the race car, that is why I remember distinctly it was the Anamosa fair.

I don't know why the picture of Mr. Tracht was on it, because Mr. Tracht was a partner there, and there was no room for him to sit on the back, and just had a place for him to sit there, and Mr. Tracht held up the bacon, and that picture hung around the garage for a long time. He was not a partner of Monckmeier. It was Monckmeier who brought back the bacon, but Tracht was supposed to be carrying it back, I don't know. It wasn't a picture of Monckmeier, but "Cappy Tracht" sitting on the back of his car.

Jack Henderson was working there at that time. The only work that Jack Henderson done on getting that car in condition for the Anamosa race would be what

little work would be around, he didn't do any mechanic's work at that time because he was no real mechanic. That was the only time, during the period prior to November, 1915, that Mr. Monckmeier's car was tore clear down that I remember of. That was the only time the pistons were taken out, during the time I was there. I was there every day except Sunday. I would have known if that car had been torn down at any other time, unless they tore it down Sunday and put it back the same day. They could have torn it down Sunday or Saturday night and had it back together by Sunday night and I wouldn't have known it because I wouldn't see it.

I was 27 years old at that time. I had passed through a complete automobile course in Kansas City. I knew about the repair of cars.

I do not know where Henderson is now.

I saw that Monckmeier, Staver No. 9 car plenty of times in the garage. That was the only time I tore it down, that is to tear it clear down. We ground the valves, we might take up a bearing, that is the only time I saw it tore down. I did not take out those pistons. They took them out themselves. I saw them taken out. I remember that no more particularly than I would working on some other job. I saw the pistons when they were taken out. Monckmeier took the pistons out himself. He took out the cast iron pistons like Exhibit 3-V, except that it did not have either the slots or the holes, nor the slit in the skirt. I don't remember what kind of ring grooves it had; the rings weren't on, they were taken off the pistons. I didn't pay much attention to the spaces between the ring grooves; pistons were all made about the same at that time. I don't remember what kind of rings those pistons had. I was going to say these were Simplex rings, but they wasn't. I couldn't say whether or not they had an Inland ring on them; I did not know the Inland ring at that time. There was only one ring in particular I knew of outside of the ones put on the pistons when they came from the factory, the Simplex ring, a little steel ring where you fill the slot up with them, I think 1/8" diameter, and then you fill the slot, fill the whole ring groove. The reason I remember that distinctly, we put them in a Ford, and one ring went over the top and tore off the whole piston.

I attended the automobile school in 1914. They didn't teach us how to make pistons. They just gave the instructions of what the different pistons and rings were for.

In 1914 and 1915 I had not heard of any particular make of piston ring. I didn't hear of the Inland piston ring and never saw it advertised in the magazines. I have seen a piston ring like on Exhibit 3-W, but I hadn't seen it at that time. That is an Inland ring. I can't tell you whether or not the Monckmeier piston he took out of the car had Inland rings on.

The first Inland piston rings I saw was in 1919. I bought a set of them and tried them in an old Overland, to try them out. It is a good ring. If he would have taken the ring off the piston, it would attract my notice; but to look at the ring on the piston, it wouldn't attract my notice. I had never seen a ring in which the two parts overlapped for almost half of the circumference until I saw the Inland ring. The salesman came up and showed it to me. If I examined the piston I would have noticed it. I didn't examine the pistons Mr. Monckmeier had, to have them close to me. I am dead sure the pistons Mr. Monckmeier had in his car did not have holes in the skirt. I didn't know that all the Staver pistons at that time had holes in them.

No other racing cars that I saw had holes in the pistons. I saw only one, just Monckmeier's racing car and Ford Steele's—only two racing cars built by the factory, I saw.

Referring to the oil groove in Exhibit 3-V, the ring scraped the oil down there.

Mr. McCoy: You mean the slot at the top of the skirt?

(Narrative continued) The top slot is what I call the oil groove. I don't know what it is specified for but the ring scrapes the oil down and it goes through there. I didn't know anything about an oil groove at that time. I call that an oil groove now. I hadn't seen any oil grooves in pistons at all before that time.

Q. You didn't know it was the practice to run a groove, for instance like shown opposite the wrist pin bearings, all around the piston; I am referring to the groove in 3-V right above the wrist pin bosses below the lowest ring land? A. You couldn't use that as an oil groove when you had holes drilled inside to let the oil get away.

(Narrative continued) That piston didn't have that groove. I don't remember it had that little spot there

or not, I didn't notice that, but I noticed this here around there, this bottom.

Mr. McCoy: The transverse slot.

(Narrative continued) I wouldn't have noticed a groove right below the lower ring land unless you took the piston up and looked at it, which I didn't do. The piston was laying right on the bench. I didn't photograph it in my memory. I did not look for a slot in the piston, but if it had been there I would have saw it.

Q. That is your whole idea, if it had been there you would have seen it, and that is why you say now, 17 years later, you didn't see it; isn't that right? A. There was no slot in the skirt of that piston or around the top when I took it out.

Q. I am asking you what you base it on; you didn't even take the pistons out of the engine? A. I didn't take them out myself, no.

(Narrative continued) I didn't put any other pistons back in. I didn't go home and write down anything as to what I saw on those pistons. I didn't make any note, whether they were or were not ordinary pistons.

I don't know how many cars I took down in that garage during the year 1915, I couldn't keep track of it. There were many of them. There were Fords and Cadillac-four. That Cadillac-four had plain cast iron pistons. I do not know whether or not they were relieved opposite the wrist pin bosses, that is, had parts cut away opposite the wrist pin bosses. I know they didn't have any splits or an oil groove around there for oil. I didn't particularly notice the construction of every piston. I don't know why I didn't. I can't say that I noticed the construction of the Monckmeier piston any more than I noticed the construction of any other piston that was taken out of a car.

Q. In other words, as far as you remember now, 17 years afterwards, the pistons that were taken out of the Monckmeier car were just pistons? A. Yes, sir.

Q. That is what you remember now. And it didn't impress itself upon your memory, whether they were different than any other pistons? A. No.

Q. You just didn't notice it, did you? A. I didn't notice whether it was any different than any other piston, no.

Q. And just because of that you are willing to swear they didn't have anything else in there, that they were nothing else but the ordinary pistons? A. Yes.

Q. You are willing to swear to that? A. There was no slots in those pistons.

(Narrative continued) I don't know how long I saw those pistons. I did not look at them very long. I saw them when I went by the bench, when they were laying on the bench.

Mr. Wells came to me yesterday an asked me if I had ever worked on Monckmeier's Staver, and I told him yes. He wanted to know what I had done, and I told him. I told him I had ground the valves. He asked me what I had done and I told him I helped tear the motor down and send the block to Cedar Rapids and they had reground it and they put new pistons in, fit new pistons, aluminum pistons, at Cedar Rapids. I told him I didn't know whether they were cast at Cedar Rapids or where they were made, but they came back with aluminum pistons fit on, and I ground the valves and Kinney and Monckmeier fit the pistons on the connecting rods and bearings, and I helped put the block on; that is the very words I used. He asked me if I knew what the pistons were like. I said they were just like the cast iron pistons that came out, with the exception that they were aluminum. He asked me if they was any different than the others and I told him, and he said, "Well, were they split skirt?" and I said "No." I said that without hesitating. He wanted to know how I knew it wasn't a split skirt piston. I told him the first time I ever saw a split skirt piston was in '21 or '22, and I thought it was broke.

Q. When did you first see a Chinaman, how old were you? A. I don't know.

Q. You don't know, do you? When did you first see an Indian? You don't know do you? A. I was pretty young.

I never had any contact with a split skirt piston until 1921 when I first noticed a split skirt piston. That piston had a straight split up the side, with a hole right in here (indicating) and a cross slot here. The other side was just a plain straight, flat piston.

I took that particular piston out of a machine, and handled it myself, and I thought it was broken. I noticed it was split. I saw that it had a slot on one side. This other side had this there, but not split. It was

relieved from here down to there; it was a little smaller here than it was down there. (Indicating.)

I know that because I could tell by the way it fit when we come to put the pistons in. I noticed that when I put it back, I noticed it had to go in from the bottom. It was not like Exhibit BBB in this case. The split was straight and there was a little hole drilled here. The vertical slot had a little hole drilled clear through, I don't know what the hole was for. (Indicating the point of connection between the longitudinal slot and the transverse slot.)

That hole was right close to the top. It didn't run into the ring lands. It wasn't free quite as much here. (Indicating the boss section.) It didn't have so much relief on the wrist pin boss. That piston wasn't like Exhibit 3-K, because this piston was supposed to be split in two when it was put in the motor. It wasn't like it except for that little hole, because this here slot wasn't in the ring groove, it was down below.

I did not pick up and examine those cast iron pistons that were taken out of Monckmeier's car in 1915. I don't know what I was doing at the exact time those pistons were being taken out of Monckmeier's car. I helped tear the motor down. Then I had to go some place else and they finished it up, I wasn't there when it was taken clear down, I just helped loosen the bolts. I was in the garage, I wasn't working on the car directly. I was in the place. The place was only 30 feet wide, and 80 feet long. I couldn't have been very far away. I may have been 20 feet away. I didn't examine the pistons when they were taken out. I saw them after, at Monckmeier's car. I knew they were for his car because I saw them take them off and put them there. I did not examine them. He took them out of the connecting rods and sent them to Cedar Rapids, and he had to put new bearings in for the connecting rods. He saved the pistons, the iron pistons, and carried them around with him. I didn't pick them up and handle them. I was working right along the bench where they were all the time. I glanced at them and saw they were pistons. I saw there was no holes in the pistons or no slots when they were there. I remember that from those few glances, if you can call it glances; it is like looking at a piston on the bench, you can remember whether that piston had a slot in it, looking at it. There was nothing that caused me to observe the piston closely.

Of the hundreds of cars out of which I had taken pistons, I couldn't tell you what kind of pistons they

had in them. The reason I should think more of the Monckmeier was because that was the first car I ever saw or heard of that had aluminum pistons, and we were arguing whether it would stand the heat and compression. That was the first car I ever saw that had aluminum pistons. I remembered the piston had a concave head because he carried it around in his hand and hit it with a hammer to show the boys how much strength there was in the aluminum. Monckmeier did that. The concavity wasn't as deep as some they are putting in nowadays in some of the cars. I imagine an eighth of an inch deeper in the center than in the edge. It had no holes. They ruined one piston and had to get another one, and that was the one Monckmeier carried around, hit it on the head with a hammer. The machine shop at Cedar Rapids ruined one piston. If it wasn't ruined he wouldn't be pounding it all to pieces.

Q. Is that the way you determine it was ruined because he pounded it all to pieces? A. I don't know what else you would say.

It wasn't in the fall of 1913 that that car was torn down for the Aluminum races; it was in the summer, July or August. I started to work for Kinsey in April, and he didn't do anything with it at that time because he raced with the old pistons. The diameter of that piston was about 4", I think; I don't know for sure. I didn't measure it. I would say it was about a 4"; it could have been a 4½; I didn't measure it. You couldn't tell just by looking at a piston whether it was a 4 or 4½. I can't do that now; you can't tell by looking at it; I am not that good on gauging dimensions. If it is an inch above, I could tell, whether it was 4" or 5".

I saw Monckmeier put those pistons in that car, the aluminum pistons. I held the block up while he fit them up in the wells. I saw the motor after it was together. I was holding it while he was starting the pistons from down below. I saw the kind of pistons he put in. I saw them hanging on the connecting rods, looking over the top of the block.

That is the first aluminum piston I had ever seen. That attracted my attention very much, that it was an aluminum piston. I didn't talk to Mr. Trusht about this. I haven't seen him. You spell his T-r-u-s-h-t. I did not talk to Mr. Henderson, Jack Henderson, nor with Mr. Kinsey. Mr. Wells did not tell me how he got in touch with me. He was the only one who came up to see me.

I don't know Mr. Jordan's first name. They called him "Mary." That is the name he goes by, is "Mary" Jordan. I don't know what his first name is. He is a druggist in Springville. He had that National car. He built it as a racer, and he had aluminum pistons in it. I saw those pistons because he took the block off there, and I saw that they were aluminum. Mr. Jordan knew Mr. Monckmeier. Monckmeier was the one who talked him into doing the job. Monckmeier and Kinney together got the commission on that.

Reed Carl owned that model 16 Buick. That also had aluminum pistons. That was 1915, the same year. Both Jordan's and Carl's pistons came from the same place as Monckmeier's. I have an idea the machine work was done at Fawcett's, I don't know where the pistons came from. That was all in 1915, before November, those three sets of pistons.

Mr. Brundage: That is all.

Re-Direct Examination by Mr. McCoy.

The piston that Monckmeier carried around in his hand, he would take like that, take a hammer and see how hard he could hit it on the top, to show them how much strength the head of that piston had. That was in the same year he put them pistons in that car. He showed Reed Carl what that piston would stand, because Reed was just like the rest of us, he didn't think they would stand the strain, before he put the pistons in. He took the hammer and hit that piston. I remember it distinctly because he done it so many times. That piston was not split. There were no slots in the skirt well running crosswise, across the piston. Take one of those big pistons the size of that and hit that with a hammer and see what happens.

I saw that piston that was carried around by Monckmeier when he had it in his hand, he would reach up in front of me and hit it with a hammer. I didn't pick the piston up and carry it around and do it myself because it wasn't mine.

The aluminum pistons put in "Mary" Jordan's car and in Reed Carl's car were not split. Each of those sets were plain pistons.

Mr. McCoy: That is all.

Re-Cross Examination by Mr. Brundage.

I did not examine the inside of those cast iron pistons that Monckmeier took out of his car. I couldn't tell

you how the inside was. I didn't examine the inside of the aluminum pistons. All that I noticed, the pistons were awful big through the end of the skirt. I remember they were bigger than the piston we have today.

Monckmeier hit the aluminum piston on the head with a hammer, and it didn't break. I suppose the reason it didn't break was that it had the strength there to keep from breaking. I didn't look on the inside to see what made that strength.

Q. Look on the inside of Exhibit 3-W. What do you think would give strength to a piston of that kind?

Mr. McCoy: Objection, asking for a conclusion of the witness.

A. Well, that piece across the top should give it strength. I mean the rib.

I didn't take the trouble to look inside of the piston to find out what made it so strong. I held it in my hand, I lifted them to see how light they was, took one in one hand, the cast iron in the other, and the cast iron would drop my hand.

Mr. Bruninga: That is all.

(Thereupon, adjournment was taken to Friday A. M.)

(Thereupon at 9:30 a. m., Friday, March 17, 1933, the hearing was resumed.)

Jack Henderson, a witness called in rebuttal by Plaintiffs, being first duly sworn, testified as follows:

Direct Examination by Mr. McCoy.

My name is Jack Henderson. I live in Wheatland, Iowa. I run an automobile repair shop in Wheatland. I have lived in Tipton, Iowa, off and on; I was born and raised there, and then I went to Lowden, in the army in Lowden, and I was out of there for about ten years. The first job I had after I left school was working for Bill Kinney. He was running a garage and repair shop at Tipton, Iowa. I would say I worked for him a couple of years. I remember the names of others who were working for Bill Kinney about the same time I was employed there; there was Everett Trecht, Charley Sweet, Fulwiler, and Monckmeier off and on, Gus Monckmeier, and that is all, I guess. That was Everett Trecht, who was known as "Cappy" Trecht. Fulwiler's first name was Bert.

Mr. Monckmeier was a repairman at the garage, worked along with the rest of us. He was also engaged in racing about that time. The races that he attended at the time that I was employed with Bill Kinney were Anamosa, DeWitt, Williamsburg, Central City, and there was others, but I don't just remember them now. I remember the character of car Mr. Monckmeier drove. It was a six-cylinder Staver, painted white, with the number 9 on the hood. It had a Teeter-Hartley engine. It had yellow wood wheels on it, and some Michelin tires, I believe Michelin tires. It had racing seats, bucket seats. I said the engine was a Teeter-Hartley. I saw that engine down while I was working for Kinney. Those with me at the time I saw that engine down were Sweet, Bill Kinney, Gus Monckmeier, "Cappy" Trecht. The engine was being overhauled when it was down. I took the oil pan off and washed up the parts, and helped lapping the valves a little, grinding them by hand. I did only a part of the valve lapping. The engine was taken apart other than just to grind the valves. The block was taken off, and I took the oil pan off, and there were rings or pistons or something put in. I don't remember what was put back in it.

I know what came out of the car by way of pistons. To the best of my recollection, they were a cast piston, cast iron. The pistons had holes in them, drilled holes. I seen them in it. They were different from other pistons at that time is why my attention was directed to those drilled holes. Other than being probably interested in trying to get interested in the racing business or anxious to work or something like that, I noticed the difference in them.

There were no slits in those pistons such as you see today in split skirt pistons, or commonly known as split skirt pistons. There were no splits of any kind in those pistons. I took the oil pan off and there were pieces of pistons down in the oil pan when I took it off; they were down in this oil pan. There were pieces out of the skirts of the pistons, and they were mixed in with the oil. I knew from the shape they were in they were from the pistons. I looked up underneath and could see where the pieces came out of the pistons. I saw the pistons again after they took the block off, the pistons were still on the connecting rod. I noticed the breakage in those pistons then. They were broken between the holes on the piston; the pieces had fell out.

Comparing the iron piston marked Exhibit 3-V, the pistons that came out of the block were of that type, and holes in them. I do not remember any slots in those pistons. Those pistons did not have slots similar to the transverse slot between the bosses to which you have directed my attention. There were no slots in those pistons that I recall. The breakage in those pistons was in the bottom part of the skirt here, pieces came off of this part.

It was about 1915 or 1916 that I was working for Mr. Kinney on the overhauling of the Stayer car owned by Gus Monckmeier. I can't place it any closer than 1915 or 1916. It was before the World War, or before this country entered the War, I mean. It was during the time that the European war was in progress between England, Germany and France. It was in the summer time, or some time in there. It was warm weather.

I remember the purpose of that overhauling job. It was to prepare for a race or races. I think it was for the Anamosa, Iowa, race. The car was afterwards taken to Anamosa. I know that because the boys came back with the word. I didn't see the car in Anamosa. At that time I was working for Bill Kinney in the same garage. I saw posters or advertisements that there was to be an Anamosa race. The Stayer car was in the shop before the race, but it didn't remain in the shop during the race. I saw it leave and return.

I am the only Jack Henderson who was working for Bill Kinney at that time. There is no other Jack Henderson in Tipton that I know of. I know of no other Jack Henderson in that neighborhood.

Mr. McCoy: Direct examination closed.

Cross Examination by Mr. Brunings.

I have seen this piston Exhibit 3-W before today. I saw it in Davenport in January of this year. Mr. Monckmeier showed it to me because he wanted to refresh my memory. I went over to Davenport to see him. I told him I didn't remember the piston. When he showed me the piston I told him I remembered the concave head in the piston; I told him that. I didn't tell him I remembered the way these slots were cut in here by drilling holes; I said I didn't remember that, I am positive I said I didn't.

I think I remember later on, or a few days later on, Mr. Monckmeier phoned me in Wheatland at my garage.

I don't remember whether it was Sunday or not. Mr. Monckmeier was going to come over to see me with another man on Sunday. I remember Mr. Monckmeier calling, and he came up there later. I don't remember whether that was in the middle of the week or on Friday when I was in Davenport. I remember going to Davenport on other business. I stopped in to see Monckmeier and he showed me this piston. Then I told him I remembered the concave head on the piston. Then a few days later on, Mr. Monckmeier 'phoned me, and he had some conversation with me about this piston at that time. I did not say that I would try to fix the date as close as I could when I saw this piston. I didn't say I was going to scrape up my memory and try to get some records as to the date of this piston.

Q. You said you went to war later. Did you say during that conversation on Sunday over the telephone that after you worked at Kinney's garage you went into the army during the world war? A. I don't remember that.

I went into the army. I didn't say I was going to try to place it by the time I went into the army, going to try to place the date when I saw this aluminum piston.

Q. Do you remember about the latter part of January some gentleman calling you up and getting you out of bed about ten or eleven o'clock at night at your hotel? A. Yes.

Q. And he asked you what you remembered about this piston, whether you had checked up any records; do you remember that, or were you too sleepy? A. Well, he asked me my age for one thing, I remember, and about slotting the piston, and I told him I didn't remember that.

Q. In fact you told him it was so long ago that you couldn't remember anything about it; isn't that right? A. Well, I don't remember whether I told him that in that way or not. I told him I didn't remember the slotting.

Q. And you said also at that time when you were called up late at night that you had tried to fix dates and tried to remember what you saw back there in Tipton, Iowa, but that you simply couldn't place it at all. Is that just about what you said? A. I don't remember just the exact conversation. It wasn't very long.

I did tell Mr. Monckmeier, when he called me up, that I remembered the aluminum piston he put into the car, as to its having a concave head like Exhibit 3-W. From the conversation in Davenport, I heard it mentioned. I didn't tell him that I remembered the T-slot. I didn't tell him on Sunday that I remembered the T-slot. In that late January telephone conversation, when I was called out of bed at my hotel in Wheatland, I said I didn't remember much about it.

Q. And that is a fact, you don't remember much about it, do you? A. About the slot?

Q. Yes. About the piston. A. No.

In 1915 I was 17 or 16 years old. I was born in 1898, November. That would make me approximately 16½ years old when I saw this engine in 1915.

I do remember that Mr. C. H. Sweet was there at that time. He was working there. He was mechanic and repairman. He helped in overhauling that engine when it was torn down before that Anamosa race. I don't remember what part he took in overhauling it. I helped grind the valves; I didn't finish the job on them. I wasn't allowed to finish such things. Neither Monckmeier nor Tracht ground the valves.

(Short recess taken.)

I think it was just before the Anamosa race that that Monckmeier-Staver No. 9 was overhauled in Tipton. Bill Kinney was then the owner of and running that garage in Tipton. I think Bill Kinney helped on overhauling that car. Monckmeier was the owner of the machine; he naturally would have charge of the work. Fulwiler was not one of them at that time. He wasn't there at that time. The people that were there were myself, C. H. Sweet, "Cappy" Tracht, Bill Kinney, and Gus Monckmeier. Some of the other fellows working there ground those valves. I know I lapped them as much as I was permitted. I imagine I had been out of school over a year, I know, when I came over there. I worked the previous year for Kinney, before this car was overhauled, before this machine was in there. While I was there, Monckmeier's automobile was hauled in there. I had worked there almost a year when that Monckmeier machine was hauled in for the Anamosa race. I started to work there when I was somewhere around 15, between 15 and 16 years old. I was familiar with automobiles

just as a kid trying to learn a little. Some things I learned and some I didn't.

I didn't finish the valves at the time that that car was taken down; I helped on those as a kid helper would. There was a Teeter engine in that car. The pistons were about the same size as Exhibit 3-V, the cast iron piston. The diameter of the cylinders was four inches, I guess, or somewheres around there; they might have been 4½. Looking at Exhibit 3-V, I would say that the diameter of that piston is around 4".

I took the oil pan off of Monckmeier's car also. As I recall it, it was an aluminum oil pan. I do not remember what kind of rings that piston had that was taken out of the Monckmeier car. I am familiar with the Inland ring. I know it is a long lap ring. I know that is an Inland ring on Exhibit 3-V, except that it is broken. That was the only ring at that time that was ever put out with this long lap, that I remember of, that I have any knowledge of. I do not remember whether or not those cast iron pistons that were in the machine when we overhauled it had Inland rings on them. I do not remember whether any Inland rings were put on the pistons that we put into the car later on. I probably didn't know the name of piston rings then. I would have noticed that distinctive type of the Inland ring at that time, because I didn't see an Inland ring before 1915. It came on the market somewhere around 1914 or 1915.

I said the pistons that were taken out of Monckmeier's car had holes drilled in them. I remember that distinctly. Those holes were about of the same character as these holes in Exhibit 3-V, round holes. They looked about the same. I do not know whether the pistons had any oil groove around them that would catch the oil and let it go back into the piston. I am familiar with the use of an oil groove around the piston in order to let oil run back, to scrape off the oil in order to let the oil get back to the inside of the piston. I didn't notice whether those pistons taken out of the Monckmeier car had such an oil groove; I wouldn't say they didn't; I wouldn't remember that; I wasn't familiar with those things at that time, that is, the groove. The thing that caught my eyes, on that piston that was taken out of the Monckmeier car, was the holes in it. I had never seen holes in pistons before. I had never seen slots in pistons before, either.

I said that one of the pistons was broken or there were pieces of the skirt in the oil pan. Those pieces were

of cast iron. You could tell by looking at them. I had to flush the pan out. I imagine those pieces would run ¾", around there, different odd shapes. There were six cylinders in that car and six pistons. That was a six-cylinder Staver No. 9. One piston I know for sure was broken. I don't remember whether any more or not. It wasn't broken up; just pieces out of the skirt, and when I took the pan off, they were in the pan. I wanted to see where they came out of, what they was. The piston was jagged, you know, where the pieced would break out. It was somewhere along the lines of Exhibit 3-W. It would be, not—just jagged, the edges along. They ran into the holes.

I didn't take any of those pistons out of the cylinders. I just saw them from underneath. I used a light to look underneath. We had an electric light in that garage at that time. I looked in several of the cylinders, I imagine, before I found them there. I looked into the cylinders to see what the pieces were from. I finally located one of the pistons that looked like that, and by simply looking up inside, I could tell one of the pistons had ragged edges.

Some of the other fellows there took the block off. We had to use a 2 x 4, crossing this old building, then we had a rope, block and tackle. Had to take the cylinder block off in one piece; it was cast all in one piece. That left the pistons on the rods.

I am sure those six cylinders were cast in one block. I don't know who was the one that lifted off the cylinder block; some of those fellows—Sweet. I wouldn't say just who took that off of there. Sweet wasn't doing the grinding at that time, that was after they had the block off. Sweet did some grinding after the block was off. I ground as much as I knew how to grind. We used two compounds at that time,—one coarse and one fine. Sweet didn't do all of the grinding; I ground some of it, I know.

I know Sweet was in town yesterday. I didn't see him at all. It has been quite a few years back since I have seen Sweet. I know Sweet was in town here in Cleveland because I was told he was here. Mr. McCoy told me. Mr. McCoy asked me if I knew Sweet. That is all he asked me. And I answered yes. Mr. McCoy asked me whether I had worked with Sweet in that Tipton garage. That is all he asked me about Sweet. That was yesterday. I wasn't in the room yesterday when Sweet was testifying.

After the cylinder block was lifted off of that Monckmeier motor, that left the pistons standing up on the connecting rods, except that they would flop over to one side or another. I saw those pistons then. I did not go up to them and examine them carefully. I just took a general look at them. I don't know what happened to those pistons then. They possibly took them out, I imagine. I don't remember that I saw anybody take them off of the connecting rod. I never saw them lay around later on. The looks I had at those pistons, those cast iron pistons, were the looks I had from below with a light and another look that I had while they were standing there on the connecting rods. I don't remember how close I came up to them. I didn't examine them very carefully, just was interested in what the difference was between the pistons of that time and the racing pistons; they looked different and I wanted probably to see what the difference was. I didn't examine them carefully. I wouldn't be able to tell you today the details of any of those six pistons other than the cracks or breaks in them. That is all I could tell—one of them had breaks in them. It could be that there might have been a T-slot on one side and with no T-slot on the other side, but I wouldn't remember that, I guess not.

I do not know what kind of pistons were put back into that car. I do not know whether any aluminum pistons were around there. I have never seen Exhibit 3-W before today.

I said that I remembered a Monckmeier piston with a concave head, because I heard Gus tell me that, you know, when he was talking about the racing car and talking about the different features it had, and something was a little different. He told me that, I imagine, when I was around there working for Kinney and when he was around there, around town, just a small town. He told me something about aluminum pistons. He told me about the concave head idea, he explained to me it centered the explosive charge; that is the only thing I remember of there. That was at the time I was at Tipton. I don't remember whether it was the same year as the Anamosa race or not. It was while I was working around Tipton, either with Kinney, or around Tipton some place. I think it was at the time Gus Monckmeier was still running in races. He never told me he had some kind of slot in that piston. I don't remember that.

I came here to Cleveland as a witness. I was asked by Mr. McCoy. He came over there in Wheatland to

see me, I don't know if it was the first of this month (March) or the last of February. Attorney Wells was with Mr. McCoy. He is an attorney in Davenport. I did not know Mr. Wells until he came there. I did not make any written statement at that time. I didn't sign any statement.

I don't know whether Mr. McCoy saw anybody else about this Monckmeier piston around Wheatland.

I didn't go with Mr. McCoy to see anybody else. I am being paid for my expenses here and back.

I know the pistons that were taken out of Mr. Monckmeier's car before the Anamosa race were made of cast iron. They were made of cast iron and had holes in them. I haven't a clear picture in my mind of the fine points of that piston.

Mr. Bruninga: Cross examination closed.

Re-Direct Examination by Mr. McCoy.

Q. Are you sure in your own mind as to whether or not those pistons were split? A. Like Exhibit 3-V?

Q. I am referring to the split underneath the head and the slit along lengthwise of the skirt. A. I don't think they were.

Q. Are you sure whether they were or not? A. No, I don't believe they were.

The occasion for my visit to Mr. Monckmeier was, he wanted to refresh my memory as to the slots in that piston. He asked me to come to Davenport. I was going down on business anyway, and he told me to come in there in his factory. I went to the factory in Rock Island. That is where I saw Mr. Monckmeier. I afterwards saw him at his home. The occasion for the visit to his home was that he had the pistons there.

No one went with me to Mr. Monckmeier's home, just up to the front there of the house. The girl in the hotel went along down with me to do some shopping there. She remained in the car because she didn't know them. Mr. Monckmeier didn't say anything about bringing her into the house.

Mr. Monckmeier's wife came to the door and she left there then. I don't know whether she was in the house; I didn't see her any more, I don't think. No one else was with Mr. Monckmeier. As to where Mr. Monckmeier showed me the pistons, I am not familiar with the different rooms in the house; it was in the house, though, in a little room there in the house,—not in the factory.

When he showed me the piston he asked me if I remembered the piston and the rings and the slot in them, and I said "No, I don't remember them," the slots, only just what he showed me there, and the rings, we talked about that, and the concave head, talked about those—I don't remember. I had a recollection of the piston, though, except for the slots in it.

Pistons were removed from the Monckmeier engine by taking the block off, I believe. I don't think those pistons could be taken out of the base of that car. It required disassembly of all the structure on top to take the block off.

Mr. McCoy: That is all.

Re-Cross Examination by Mr. Bruninga.

Q. When Mr. McCoy asked you whether you were sure whether the piston you saw out of Monckmeier's car did not have those slots that you see on 3-V, you hesitated a while to think it over, didn't you? A. Yes.

Q. And really you can't tell now after seventeen years whether those particular pistons may have had slots in them? A. Well, it is quite a long time to remember those things.

Q. Well, wouldn't you swear they did have slots now; would you, from the look you had of them? A. No.

Mr. Bruninga: That is all.

Re-Direct Examination by Mr. McCoy.

I first saw a split skirt piston when I worked for Harter Trady; that was after I was in the army. I recall that piston because it was new, I guess, a new type; something we hadn't had in the shop before. The slots in it, the general make up was new, I guess; being different from the cast pistons that run along in those days.

Mr. McCoy: That is all.

Re-Cross Examination by Mr. Bruninga.

I know that the piston I saw when I worked for Trady had a slotted skirt on it; I don't know just how it was slotted, as to the angle of it. I don't know whether it looked like Exhibit 1. I don't know if it was the same make or type piston as Exhibit CCC. I worked for Trady, and I remember it was a slotted piston, that is all. I don't just remember just how it was slotted—naturally down through the skirt. That is the way I see

them slotted today. That was about 1920, or somewhere around in there. No one tried to sell me a piston at that time, I was working for Trady; I wasn't buying anything. I happened to see it because we took the car down that had been in. I didn't do that myself. But this man I worked for run the machining operation. I just took the motor down, and we both worked on the job. We both worked on the pistons. We ground the rods and assembled the pistons back on them and put them back in. In other words, I took out the split pistons, fixed them up, and put them back in.

Q. I am speaking about the first time you saw the split pistons; did you take the pistons out of the car; is that how you happened to see them? A. Yes.

I think I put them back in them. I handled them myself in that case. I had a good chance to look at them. I remember they were slit, and they were aluminum pistons; I remember that part. They were not cast iron pistons.

Mr. Brauinga: That is all.

The Master: I want this read to the witness, the question and the answer that he gave.

(The upon the following question and answer were read to the witness):

Q. You say you probably, well, do you know that you actually examined them carefully? A. No, I didn't examine them carefully.

Q. As a matter of fact you wouldn't be able to tell me today the details of any of these six pistons? A. Other than the cracks or breaks in them.

Q. That is all you could tell, one of them had breaks in them? A. Yes.

The Master: What did you mean by the "cracks"?

The Witness: The pieces that were broken out.

The Master: That is all.

Mr. Richey: Now, I think your Honor was going to bring up the question of this evidence. I don't know whether you understand my position or not. I can state it succinctly. My adversary has offered in evidence a copy of the File Wrapper of the Patent Office, which is just part of the contents, part of the record of the interference, that is Exhibit 4-F; third, he has put in through Mr. Gulick,

portions of the testimony of Mr. Gulick of that record.

The Master: On cross examination, by asking him if he testified so and so, and on such and such an occasion.

Mr. Richey: Yes. And fourth, under the rule of this Court of Appeals in *Goodbody v. Firestone*, 23 F. (2d) 625, page 626, the Court there refused to reject an affidavit regarding the dates of invention on the ground that it was fourteen years old, and as the court said to place upon the patentee the burden of establishing the truth of an affidavit after a lapse of fourteen years would in their judgment be unreasonable.

Now, here we have testimony that was taken relating to matters going back as far as 1911, and a good part of which is already put in in the regular form.

Mr. Brumings: I think counsel has mixed up another thing. In the first place, there is a difference between the substantive and the judicial portion of a judicial record. In the case of a substantive portion, the record itself attests its correctness, but a judicial portion is admissible only as between the parties to the record. That is a well-settled law of evidence. Evidence in a former proceeding can never be used unless the parties are the same, actually or in privity. That has not been shown here at all. As a matter of fact it is not so. It is well-settled that evidence cannot be used against a stranger who has no opportunity to cross-examine. Now, when we come to admission of portions of a record, only those parts necessary to a judgment can be admitted by one party or another under proper circumstances.

(Thereupon further argument was had by counsel.)

Mr. Brumings: Now, to make the record clear,—I didn't know it was going to be mixed up as much as this,—I would like at this time to make an objection to the offer in evidence of the opinion 67B, 67-C, 67-D, 68A, B and C, 69A, B, and C, and 70A and B. I had no objection if used as evidence, but if they are going to be used as a lever to get in evidence to support these decisions, that is a different proposition.

Mr. Richey: They weren't used as a lever, but on the basis of what you put in, on the basis that you put in the balance of it.

(Further argument had.)

The Master: I understood yesterday those decisions went in without your objection. Now you are objecting.

Mr. Bruninga: If the Master rules that my objection comes too late, well and good. I want it clearly understood why I was not opposed to letting the decisions in, if a clear cut distinction is made between the judicial record and the evidence used in making evidence in the case, well and good, because the decision is part of the substantive part of the record, and that is absolutely correct; nobody can dispute the correctness of decisions.

Mr. Richey: I think we can dispose of that by saying that I don't rely on the decisions I offered in evidence, to justify the acceptance of the balance of this record. It is only because of what you have done. These File Wrappers weren't offered in evidence with any restriction; they were offered for all purposes. It is well established that evidence that is introduced without restriction is available on any issue which it tends to prove and which is within the pleadings. These File Wrappers not only contain direct references to these interferences, but they contain affidavits in there relating to the question of priority. The whole thing is one proceeding about the patent. (Further argument had.)

The Master: As far as this question is concerned, the earnestness with which it was presented yesterday made me think for a minute perhaps I didn't know anything about rules of evidence. When I went back to study it again last night, I am convinced the rule is that the transcript of the testimony is not admissible. The rule is well stated in Wigmore on Evidence, Sec. 1836, and also stated in *Corpus Juris*, Vol. 22, page 428: "In order to warrant the acceptance of evidence given at a former trial, it must appear that the parties to the latter trial are either actually or constructively the same, as otherwise the party against whom the evidence is brought could not have the opportunity to cross examine the witnesses."

There are a number of decisions on that. But it is not material, you know, to have the testimony

there, because the thing that the court is interested in is the decision; and that is what the decision is here in these interference cases, the decisions will be received but the evidence will not be received, and I shall so rule at this time.

* * * Inasmuch as the other exhibits went in yesterday without objection, I think I shall let them stand and exclude the exhibits offered which are in the nature of transcripts of testimony.

Mr. Brueninga: I just wanted a ruling by your Honor in order to save my position.

Mr. Richey: I suppose we may have an exception.

The Master: You may have an exception, certainly.

(At this point the testimony of Jeffries, Record, pages 914 to 920, was taken.)

Milton Tibbetts, a witness called by Plaintiffs in rebuttal, being first duly sworn, testified as follows:

Direct Examination by Mr. McCoy.

My name is Milton Tibbetts; I reside at Detroit, Michigan; I am 53 years old. I am Vice President and patent counsel for the Packard Motor Car Company, Detroit. I have been in the employ of that company since 1907, first as manager of the patent department, then as patent counsel, later as patent counsel, assistant secretary; later as patent counsel, assistant secretary and assistant vice president; and now as vice president and assistant secretary-patent counsel.

I have known Edward J. Gulick since 1908 or 1909.

About 1915 or perhaps 1913 or 1914, Gulick brought suit against the Packard Company under one of his patents. This suit was later settled, I think about in 1915 or '16, and shortly after that I had some business dealings with him concerning the purchase of some patents and inventions of his.

I think it was the year 1916 or thereabouts that Mr. Gulick brought to me his split skirt piston invention, together with several other inventions and several of his patents, with the suggestion that I might want to purchase them for the Packard Company. I am not sure whether Mr. Gulick told me of this particular invention before, because I have discussed Gulick's inventions with him, or had discussed them prior to that time, on so many

occasions I used to see him in connection with the other negotiations, that is just possible he may have shown it to me before this, but I think that at that time, in the winter of '16 or early spring, he showed me blueprints of drawings of it and that can be fixed by a letter of substantially that date, a letter that I wrote to Gulick. There was a continuing correspondence from then on regarding the inventions and patents. The negotiations extended over a period of some months, and as I recall it, it was from the early spring of 1916 until the summer of 1917.

The letters marked Plaintiffs' Exhibits 32 to 37, inclusive, are the letters constituting the correspondence referred to in my last answer, that is, the carbon letters are copies of my letters to Gulick and the original letters are letters from Gulick to me or to the Packard Company. These particular letters were taken from my files some time ago. I produced them for the counsel in this case or in some other case. That was at the time the testimony was being taken in Detroit in connection with some interference.

The three-page letter, a carbon copy of which I have here, and which is marked Plaintiff's Exhibit 32, dated March 27, 1916, but dictated March 26, 1916, is the letter that refers to the various prints and drawings Mr. Gulick brought to me at that time, also the patents which he desired to sell to me. These drawings and prints were marked by me at that time with various letters and numerals which are identified in the letter, and I could identify the drawings and prints if you have them here.

Exhibits 31 and 31 and 33 are the three prints referred to in my letter of March 26 in the first clause marked 1, these prints being identified in the letter as respectively A-1, A-2 and A-3, these identifying marks being on these prints with a yellow pencil. I recognize the lettering as mine. Exhibits 26, 27, and 29 are pencil drawing, two-page description, and blueprint, respectively, referred to in paragraph 2 in my letter of March 25, these three exhibits being identified with my lettering B-1, B-2, and B-3, respectively. I recognize the lettering as mine also. These three exhibits relate to the motor piston referred to in that letter and are the showings of the split skirt piston referred to in a previous answer.

These exhibits, Plaintiffs' Exhibits 26, 27, 31 and 32, were used by me in the preparation of a patent applica-

tion which was filed on this invention later on. These exhibits were kept in my office files until removed for the purpose of use as exhibits in the interferences referred to previously.

As near as I can remember, this Plaintiffs' Exhibit 36, which you have just handed me, is exactly in the same condition as it was at the time I received it, except for some additional markings, such as the words "Gulick Exhibit," and words to that effect. There is a notary's name on the back and a No. 1 on the front, and the stamp of the United States Patent Office in 1928. Otherwise there seems to be nothing different from what I had before me at the time in 1916.

Except for the Patent Office and exhibits markings thereon, Plaintiffs' Exhibit 37 seems to be the identical paper as was before me in 1916.

If you are referring to the black ink writing in the lower left-hand side of the blueprint, Plaintiffs' Exhibit 32, I am sure this was also on the print at the time I received it. I am not sure of the pencil numerals. On the back of this print is the rubber stamp of the Buda drafting department, dated August 30, 1915. This was also on the print at the time Gulick left it with me in 1916.

My recollection is that the purchase of these various inventions including the piston invention shown in the exhibits that I have here examined, was in August, 1917. Of course this can be substantiated by the assignment, which is of record in the Patent Office.

This letter dated March 27, 1916, Plaintiffs' Exhibit 52, was an acceptance of the offer made by Gulick under certain conditions, and in order to complete the transaction I sent a Packard Company check for $2000 to our counsel in Chicago, Mr. Edward Rector, so that he might complete the transaction as soon as Gulick produced the assignments and licenses referred to in that letter. I was anxious to complete it and I assume that Gulick was also, since there was some doubt as to whether Gulick could get an assignment of all of the patents referred to, the amount to be paid was somewhat uncertain, but I sent the maximum amount so that it could be handled in case he produced part or all of the assignments. This was done shortly after my letter of March 27, 1916. I can't remember exactly how long after, but it was very shortly thereafter. I would say a few days, as I recall it, but I am not certain on that. It was no appreciable time because I wanted to get the matter cleaned up.

During these negotiations there was no change whatever in the attitude of the Packard Company regarding the acquiring of title to these inventions relating to the piston. We did our best to complete the transaction and apparently Gulick was doing his best, judging from the letters and the telephone calls, and so forth, that I had from him, and that his attorneys had with our counsel in Chicago.

Mr. Bruninga: Objected to as a conclusion of the witness, founded upon hearsay.

The Master: Same ruling.

(Narrative continued) Mr. Gulick explained to me at the March, 1916, conference that some of these patents were owned by the Simplex Company or the Amplex Company, one was a successor of the other, in Mishawaka, or South Bend, Indiana, I have forgotten which came first and which later, but he was connected with both companies, because that company that owned that at that time was in the hands of a receiver or was in bankruptcy and he was endeavoring to get the patents back in his own name so that he could assign them to me; and that was the trouble he was having and was the cause of the delay over several months time.

Mr. Bruninga: Again objected to as hearsay.

I can't say exactly how frequently Mr. Gulick got in touch with me during that period, but I just recall that he had written me on several occasions, had called me on several occasions, I had met him in Chicago once or twice while I was over there on other matters, in an endeavor to get this fixed up. The recollection that is in my mind of the whole matter is that it was a continuous performance, we were trying to buy all the time and he was trying to sell, trying at least to get the title so that he could complete the transaction which was started in March.

All of these patents and inventions that we were trying to purchase were in one group, and during the period one or two patents would be withdrawn because he couldn't get them, and a new proposition would be made, and he had some other inventions, as I recall it, and perhaps one or two other patents, and a different price was agreed on, all of the prices around $3,000, however, and, finally, the patents and inventions that he could get were lumped together and sold along in Au-

gust, as I say, of 1917; but during all of this period the split skirt piston of paragraph marked 2 of my letter of March 27, 1916, was included in the group.

The arrangement was that the Packard Company was to file and pay for the application for patent on this piston invention, and Mr. Gulick was to sign such papers as were necessary for those applications and for the prosecution of the application. The Packard Company finally filed this application in November, 1917, I believe. That also is of record. The Packard Company was to pay the expense and did so. Let me add to that: I might say up to the time the Packard Company disposed of the application to the assignee.

I am not sure that the date of letter, Plaintiffs' Exhibit 52, namely, March 25, 1916, was the first time that Mr. Gulick disclosed the split skirt piston, as shown in Plaintiffs' Exhibits 36, 37 and 32, to me, as he may have discussed this with me on previous occasions, but I can definitely fix that date by reason of my letter of March 27, which letter was dictated March 25, as shown by the letter itself.

I cannot say positively whether or not I had any conferences with Mr. Gulick regarding his split skirt piston prior to the date of that letter, because I discussed so many inventions with him that I just don't know. I certainly would not testify that I had not because it is quite possible that we discussed this before.

The conference I had with Mr. Gulick in Detroit regarding this matter was either on the day or the day before I dictated that letter, Plaintiffs' Exhibit 52; I think probably it was the day before, that is, March 24. I think we should here make it clear that this letter which we have sometimes referred to as March 27, 1916, was dictated on March 25, 1916. I would say that the conference occurred on March 24 or March 25, without question.

I cannot recall the exact date I started to prepare the application for patent on the split skirt piston shown in these exhibits, but I can remember that there were many things that prevented our doing it immediately, and the principal thing was the World War, which started in April, of 1917. Immediately thereafter, as the Court will probably take judicial notice, Col. Vincent, who was then our chief engineer, was called to Washington to work with several other engineers in the designing of the Liberty engine. They were all down there in

the Willard Hotel over a period of several months, and the Packard factory was working feverishly to produce the parts for it. This meant that all of us were devoting a very large part of our time, both the engineering department and the patent department, to that particular matter, and some other things had to wait. This was one of the factors delaying our work through that spring and summer. But even at that I was able to file the application in November, 1917, after our purchase in August.

This Gulick patent 1,815,733, Plaintiffs' Exhibit 2, is a copy of the patent that issued on the application which I filed on behalf of the Packard Motor Car Company in November 1917, on the split skirt piston shown and described in Plaintiffs' Exhibits 32, 36 and 37.

I cannot at this time recall anything in connection with this invention between March 24, 1916 and the date of filing the application for patent on the split skirt piston, beyond the negotiations for the purchase of the invention and the filing of the application.

Mr. McCoy: Direct examination closed.

Cross Examination by Mr. Bruninga.

As to what offices, outside of patent counsel, I held in the Packard Company from the beginning of 1916 until 1924, and the dates of the different offices (referring to memorandum), I can't recall the dates. I have given you the sequence in my answer to one of the early questions on direct examination. If you want to know what other offices I have held in subsidiary companies of the Packard Company, I can give you several of them, if they have any pertinence. The subsidiary companies were Packard Motor Car Company of New York, Packard Motor of Chicago, Philadelphia, Dallas, Texas, Packard Motor Export, Packard Motor Sales, of all of which I am assistant secretary.

I can't recall whether I was assistant secretary as early as 1916, at the time of the negotiations, or not, but I think I was assistant. I was patent counsel, which is not an office perhaps. I can't recall when I first was made assistant secretary; I can't even remember whether it was before or after the war, that is what I was trying to connect up with, but I cannot. I cannot remember when I was appointed assistant secretary. I thought some of these letters would show, but they would not show that because they were very seldom signed as as-

sistant secretary, it was more an office as a matter of convenience more than anything else. I am quite sure I was assistant secretary at least before 1922. I may have been assistant vice president, but I am not sure of the exact date of that, either.

If the Patent Office drawings marked A-4 and A-5, respectively, referred to in my letter of March 27, 1916, are not here as exhibits I cannot identify them, but I assume they are just what they say they are there, drawings made for filing in the Patent Office. They undoubtedly related to the slide valve motor. I do not know whether or not they illustrated any piston.

I testified in Interferences 49,569, 49,570 and 49,571.

I have not seen the sketch and the description, Exhibits 36 and 37, since I testified six years ago, or thereabouts, in those interferences you just referred to.

I didn't read Exhibit No. 37 over entirely while I was testifying a few moments ago, I simply testified from the appearance of it, and of course I couldn't recall it during that period of years anyway, that wouldn't do me any good to read it over. It looks the same.

I haven't examined Exhibit 32 recently. As I say, I haven't examined it since that testimony in the interferences, but I know the construction of the piston which I saw, which I filed the application on in 1917, and I am morally certain that this is the same blueprint because it has not been changed. This is also true of Plaintiffs' Exhibit 36.

As I recall it, Gulick would not sell any individual invention or patent without selling all of them. His mind was bent on selling the group, and as I recall it, one of his letters referred to selling them in a group. I am not sure that Mr. Gulick's hands weren't tied as far as this particular piston was concerned. He may have had some arrangement with the defunct Amplex Company which may have prevented him from assigning those, but that I am not sure of. I don't know what he had in mind in wanting to sell them as a group, but I know that was true. I don't recall that I asked him to deliver that one application over to me. No particular reason why I should. There was no more reason why I should pick on that application than any others, and if he wanted to sell them in a group, there wasn't any way I could get away from it. If it was dangerous to delay in the filing of an application in one case it would be dangerous in another, as far as that was concerned.

The Packard Company was anxious to acquire that particular piston as well as the others in the group. I don't know that we had any particular desire for any one of them any more than any one of the others.

The assignment provided for successive assessment of $200 for each patent which was not delivered. I thought one of the patents was valued at $100 and another at $200. In fact, there were two of them valued at $100, and two of them at $200 each.

I don't recall that I tried to acquire this particular application at a certain price without waiting for the title on the others, and I don't know that it would have made any difference, because the group was what he was trying to sell. It is my recollection that he was bound in trying to sell me the whole thing or nothing. I don't recall that he told me he was entirely free on the piston application as far as being tied to any other company was concerned. I would say it was the inability of Mr. Gulick to get the title from the defunct company that prevented the closing of the transaction. Gulick held up the transaction on his own account. I cannot speak only for Packard as far as knowledge goes, but I have pretty good knowledge of this also because I was in so much of it. I did not know that Mr. Gulick did not have a thing tied up on this.

So far as that particular application is concerned, the Packard Company in my opinion, and as I see it, didn't hold up the transaction of securing an assignment of the application, and I don't know whether Gulick did or not as far as that particular application was concerned.

The filing of the application after August, 1917, was delayed on account of the United States going into the war and Col. Vincent being appointed as the head of a corps of engineers to design the Liberty Motor; that was one of the factors contributing to the delay, which was not a very long delay. Our patent department was not put out of business so far as filing applications was concerned, between April 8, 1917, and November 30, 1917, because it may be we filed applications during that time, I am not sure; the patent department always had to work with the engineering department, and both departments were extremely busy at that time with various things connected with the Liberty Motor order.

I can't say positively how many men we had in our patent department from April 8, 1917 to November 30,

1917. I had Mr. Doolittle part of that time; Mr. Hawley, I think a part of that time; I can't remember just when they came and went.

I am not at all sure there were any applications for patent filed during the interval between April 8th and November 30, 1917 by the Packard Company; there may have been. On the other hand, when we were working on Liberty Engines I had to go back from Dayton to Detroit, and Washington to Detroit, and see the Colonel in connection with various matters while he was away from the office.

I wouldn't call that a simple application, but I can't tell you what applications were filed and when, but you can find that of record for that matter. I can't say how long it took to prepare the application of which we are speaking; I don't suppose it would take a week. I would say it would take more than a day, or it would have in 1917. I might go faster now. It is true that I have been practicing since 1907, and I wasn't new at the patent application business at all in 1917. I have spent a week almost continuously in drawing two or three claims, and so have you; whether I did it in this case or not I can't say and I won't. I can't say without records whether or not any other applications were prepared by the Packard Company between the 1st of August, 1917, and November 15th, 1917.

The piston of that application was not suitable for an airplane motor to be built as the Liberty Engine was to be built. It had to be built on tried things, tried elements, and that is what Vincent was putting into it. He was putting into it the work that the Packard Company had done for the previous four or five years on airplane engines and anything that was as new as this could never have been put into that engine. I think an aluminum piston was put in there, but not this type. I think it was a solid piston, because it was a six-inch piston; I don't think this type would go in there, anyway, not in that engine. It was too new, they hadn't had experience with it. I don't know if it was desirable to have a split piston in the Liberty Engine; I doubt it.

I know that Exhibit 2 is a patent which issued on that application, from the drawing, date of filing, and the name Gulick and the assignment of Packard to the Cleveland Trust Company, my signature on the drawing, or a facsimile of it, and everything else about it that looks like it. After the application was assigned to the Cleveland Trust Company I was advised from time to

time of the progress of the prosecution of that application; I was not sent copies of all the amendments but some of them. I base my conclusion that that is the patent that issued on the application on account of the serial number and filing date and on account of my name on the drawing, which I think is sufficient for me or anyone else to testify to.

I am not sure who prepared the application, but I think I did. If I had some of the original papers here, the file and the application, I could tell you from that.

(Witness refers to the file wrapper and contents of the Gulick application.) I filed it. I prepared it. My initials "M. T." are at the bottom of page 2 of the original specification. In order to prepare that application I had before me the blueprint, Plaintiffs' Exhibit 32, the pencil drawing, Plaintiffs' Exhibit 36, and descriptive matter, Plaintiffs' Exhibit 37, and considerable conversation with Mr. Gulick, the substance of which conversation I cannot give you at this time. That conversation supplemented the disclosures of Exhibits 32, 36 and 37, since it was a description of the print and drawing and his reasons for thinking it was a better piston than some others, and matters of that sort that any inventor talks about. I think he gave me the reasons why he thought it was a better piston; I can't remember the reasons. I don't know whether I incorporated those reasons in the application, but I assume I put enough in there to make a good application out of it; that was the custom, at least partly so. I did not incorporate in that application all the things that I found in Exhibits 32, 36 and 37, and what Mr. Gulick gave me, because it is not necessarily the thing to do. Some things should be put in and some should not be in an application. I don't recall what I left out of the application. I couldn't put everything in that the inventor told me because there wouldn't be room in the Patent Office. It has been my experience with a great many inventors that they are wordy. Mr. Gulick went on considerable about his invention, carried on a good deal. I don't recall this particular piston, but I do know that Mr. Gulick talked a good deal about his inventions and thought a good deal of them, as any good inventor does, and I have no doubt he talked about this invention.

I put into that application all I considered of importance at that time, from the disclosures he made to me. I don't recall how long before I prepared that application I had a conference with Mr. Gulick, nor my last conference with him.

Upon looking through the file wrapper and contents of the Gulick application, I note on pages 10 to 13, inclusive, an amendment received by the Patent Office July 28, 1919. It was apparently filed by my assistant at that time, Mr. H. P. Doolittle. Mr. Doolittle signed that amendment; either I signed it myself or Mr. Doolittle or someone else signed it for me with my approval. In those days it was sometimes my practice to look over an amendment made by an assistant, and sometimes not. I cannot recollect whether I looked over that particular amendment.

The next amendment dated by the Patent Office September 25, 1920, pages 15 to 18, inclusive, was apparently prepared by another of my assistants, Mr. L. W. Hawley, I believe. I don't remember whether I looked that amendment over or not, but I do know that I signed it personally. Amendment dated by the Patent Office October 31, 1921, pages 21 to 23, inclusive, was apparently prepared by me and it was signed by me. In nearly every case where my initials are used at the bottom of an amendment, as in this case, the amendment was wholly prepared by me. There have been cases where amendments have been prepared by my assistants and I have perhaps rewritten them or had them rewritten by my stenographer, in which case the stenographer might put my initials at the bottom of them, but certainly I had something to do with the amendment and probably the most to do with it if my initials appear at the bottom.

The amendment received by the Patent Office December 24, 1921, pages 24 to 26, inclusive, was also prepared by me and signed by me, with the same reservation as I have stated in answer to the previous question.

I don't know who prepared the affidavit on pages 27 and 28. There are no initials on it. For the reason that I refer to it in my amendment on page 26, I prepared it, though this particular affidavit is more or less of a form affidavit and I may have had my secretary prepare it. Maybe I am wrong; this is an affidavit under Rule 75; I thought it was a supplemental oath and now that I see it is an affidavit swearing back of a reference, it was undoubtedly prepared by myself or one of my assistants because it was necessary to get the data before preparing the affidavit.

The amendment received by the Patent Office September 12, 1922, running from pages 32 to 42, inclusive. While it was undoubtedly signed by me because I was

the attorney of record at that time, I do not know by whom it was prepared. There are no initials to indicate that it was prepared in my office, though it is possible it may have been.

The amendment received by the Patent Office March 20, 1923, pages 45 to 49, inclusive, was signed by me, but I do not know who prepared it.

The supplemental oath, pages 50 and 51, I can't say who prepared.

The amendment dated April 17, 1923, pages 54 and 55, was signed by me and has my initials appearing on it. It is probable that I prepared it.

The associate power of attorney filed June 29, 1923, page 90, was signed by me, thus giving associate power of attorney to Watson, Coit, Morse & Grindle.

The amendment of April 7, 1931, pages 104 to 122, inclusive, was apparently prepared in Mr. McCoy's office, he having been substituted as attorney in the case.

I cannot tell, without studying this case for some time, why the supplemental amendment of December 24, 1921, pages 24 to 26, was filed. I certainly have no recollection of it today. One of the reasons for filing the supplemental oath or the affidavit under Rule 75 seems to have been to antedate the Schoengarth patent, whose application was filed in October, 1915, and which patent is mentioned on page 26 of the file wrapper and contents.

As to the statement in the affidavit, page 27: "That said invention was incorporated in an automobile engine and successfully operated in the United States prior to the month of October, 1915," I do not know where that date was obtained, but I suppose it was from Mr. Gulick or from the affidavit. I may have had some correspondence on that point, or I may have gotten it by the telephone, I do not know at this time. I have no recollection of it at all, except that I think it was on the blueprint, the Buda date was somewhere in 1915, as I remember it. The Buda date was on the blueprint, too.

Q. That refers to the incorporation of that invention in an automobile engine and was in successful operation in the United States prior to the month of October, 1915, which is prior to the date of filing of the application of the Schoengarth patent? A. So I must have gotten the information from Mr. Gulick.

I can't remember whether or not I have any correspondence on that point. Of course I have none of my files here.

Q. Will you look in your files and let me know?

Mr. McCoy: Objection. The matter is immaterial, subsequent to the filing of the application, and asking for hearsay. No testimony has been given heretofore regarding the files that Mr. Tibbetts happens to maintain at his office.

The Master: What do you claim for it, Mr. Bruninga? What do you claim for an answer to this question?

Mr. Bruninga: Why, it is apparent there is some inconsistent statement in this oath. It is claimed that the invention was incorporated in an automobile engine and successfully operated in the United States prior to the month of October, 1915, and reference is had to a drawing which Mr. Gulick has admitted was never reduced to practice at all, and I believe I am entitled to obtain what data Mr. Tibbetts, or one of his associates, had to enable them to sign that affidavit, and that is particularly true since counsel wants to rely on this affidavit as establishing conclusively, they say, a certain date. It is very important now to connect that up with what was done. Mr. Gulick said the particular construction which is attached as a print was never reduced to practice at all, was never successfully operated.

The Master: I think he may answer the question. Whether the files would be admissible, would be a question for the Master to consider when the answer was taken.

Mr. McCoy: This affidavit was not by Mr. Tibbetts, this affidavit was by Mr. Gulick.

The Master: You may answer the question.

The Witness: I will, if the Court so orders.

Q. Well, I will ask you to look; and the question, after you have looked, I think the question will be whether there will be further investigation, there will be further inquiry; that is the way to dispose of it at this time.

Mr. Richey: I want to point out counsel makes the witness his own in direct examination on it. And furthermore, the purpose is to impeach an affidavit which he has brought in here. I think the matter is disposed of for the time being.

Q. Do you think you could phone your office and have them trace that matter so that you don't have to

go back and look yourself? I don't want to make it any trouble for you. A. The Gulick file papers are—there are a lot of them. I don't know how I would tell my secretary to go at looking for that particular thing. There are a great many papers in there. That might be contained in the papers which I have in that particular application file, and I haven't all of them because some of them were probably turned over to Mr. McCoy's office when the application went over to him. On the other hand, it might be in some of the other general Gulick files, of which I have several. So that I doubt if my secretary could find it; certainly she couldn't make a thorough search in the short time you want to have it made. I can have her make an effort if somebody will pay for it. I might add, your Honor, that our force is cut like every other law force, I am down to little or nothing, and my secretary hasn't time to do anything unless she is paid for it.

The Master: I will assume whatever expense she is put to it will be necessary for her to be paid for.

Mr. Bruninga: This man is produced as a witness. He apparently comes here without any records whatsoever. Counsel knew pretty well what he was going to be examined on. One of the defenses in this case has been that this application has been amended. There have been things take place during the prosecution of this application that are contrary to law. I don't mean to cast any reflection on counsel. They are not in accordance with the law at all. Counsel was advised pretty well on what this man was to be examined on, he apparently comes here, not through any fault of his, without any records whatsoever.

Mr. Richey: He was produced here to show diligence in connection with the Gulick work prior to the filing of the application. All this examination regarding this application here and undertaking to impeach the affidavit he has put in, is entirely outside of the examination in chief.

The Master: I don't think that is quite the situation. He is called here as a witness by you and he testifies as to this application having been filed, and these proceedings have resulted as part of that. I think it is proper cross examination at this time. If it is necessary for this witness to ex-

amine his files and come back here and testify as to this, I think probably the defendant is entitled to it, without the question of expense; that is something that I think the parties will have to decide between themselves.

Mr. Bruninga: This witness has not been called upon simply to show diligence; he has identified certain drawings here.

The Master: I understand.

Mr. Bruninga: And they have brought in the question of priority and I want to check that matter up.

The Master: I understand that. I think I understand the situation.

The Witness: Your Honor, may I, for my personal privilege, make a statement at this point?

The Master: Certainly.

The Witness: Since Mr. Bruninga has evidently tried to impeach this affidavit, or the honesty of the man who drafted it, I want to say, if the affidavit was prepared in my office, and I don't know whether it was or not, as I have told him already, the facts were certainly obtained before I asked Mr. Gulick to sign the affidavit; if that is the way it was done. On the other hand, the affidavit might have been sent to Gulick in rough form and Mr. Gulick may himself have put the dates in and rewritten the affidavit before signing. I can't testify as to that. But I do want to say that the whole thing may not be in my file at all.

The Master: Certainly. I think you should examine your file and if necessary come here again to answer this question, because it seems to me that is one of the vital points of this case. I may be wrong about that.

Mr. Richey: What is that?

The Master: The question as to this date and this affidavit.

Mr. Bruninga: Your Honor will remember Mr. Gulick testified he didn't remember whether there was correspondence, and that all his papers were burned up, and I asked Mr. Gulick—

The Master: I understand that. He said the affidavit came to him and he went before a notary in Elkhart, wherever it is, and signed it and sent it on to somebody, as I recollect the testimony.

(Narrative continued) As to the amendment filed in the Patent Office September 12, 1922, and included in pages 32 to 42 of the file wrapper and contents, I cannot tell whether I prepared that amendment or not. The fact that there was an assignment of the application to the Cleveland Trust Company on September 11, 1922, does not help me in determining whether I prepared that amendment, because the amendment may still have been prepared in my office, or it may have been prepared by counsel for the Cleveland Trust Company at that time. As to the amendment on page 50, preceding the supplemental oath, filed in the Patent Office March 20, 1923, and included between pages 45 and 49 of the file wrapper and contents, I can't say whether or not that amendment was prepared in my office. I do know that the amendment was signed by me. I do not know whether or not I personally went over it and approved it; neither can I tell whether I personally went over and approved the amendment of September 12, 1922, pages 32 to 42. I can't remember having a conference with Mr. Gulick after the filing of the application, but my recollection is that I did see him after that, but I am not positive. I can't remember having seen him shortly before or shortly after the application was assigned to the Cleveland Trust Company. I do remember the occasion of the assignment of the application to the Cleveland Trust Company.

Q. You at least were called in on conferences preceding that assignment, weren't you, to determine the advisability of assigning?

Mr. McCoy: Objection. This is entirely outside of the prima facie case, and our direct examination had nothing to do with the assignment of this application to the Cleveland Trust Company.

The Master: He is not asking him for anything, just whether he took part in such conferences or whether he knew about it. I think he may answer that question.

Mr. McCoy: What is your purpose? Does it have anything to do with the direct examination of this witness?

Mr. Bruninga: Well, one thing, we are trying to refresh his memory. This man has apparently prepared a lot of affidavits; he needs something to stir up his memory on some of these points.

Mr. McCoy: That is your only purpose?

Mr. Bruninga: That is my purpose. I am trying to connect it up.

The Master: He may answer and you may have your exception.

(Narrative continued) I was in on several conferences, of course, preceding that assignment, because I was the one who negotiated the sale of the application to the Cleveland Trust Company. That doesn't help me at all in determining whether I had any conferences with Mr. Gulick immediately before or after the assignment was considered. I have a hazy recollection of having conferred with Mr. Gulick. It was not at all necessary to, because he was not a party to the assignment or sale.

I didn't know there was any delay in prosecuting that application after it was filed. The filing of the amendments just within the legal period is not a delay, if they were filed then; I don't know if they were; I suppose they were. I don't know that there was any delay. As I said before, if you will point out some delay, I will try to explain it. As I say, I don't know of any delay that occurred at all after the filing of the application, because certainly five months and 28 days is not a delay. I assume there was a reason for waiting five months and 28 days before amending that application, or we wouldn't have done it. I cannot give any reason.

I know of no reason why the amendments to the specification were filed October 21, 1921 and December 24, 1921 rather than earlier. There wasn't any delay. That part of the question is impertinent.

Q. Well, you are not passing on the pertinency, now; you happen to be a lawyer before the Court, and he is passing on the pertinency of these questions, Mr. Tibbetts.

Mr. Richey: Well, he is familiar with the statutes, that is the reason he is trying to advise you. Ask him how much delay, what the statute requires.

Mr. Bruninga: You can re-direct him; he don't need any coaching.

(Narrative continued) I haven't looked at the claims of the amendment of October 31, 1921, pages 20 to 26, inclusive. If your Honor please, I am in no position to give an opinion to Mr. Bruninga on the subject of claims in this application of several years ago. It will require not only a reading of these claims but an examination of the prior art and a full examination of the application

itself. If you want me to take the time it will take me several days to do that. I will be glad to do it, but I can't do it otherwise.

Q. I am asking you whether you understand the scope of those claims.

Mr. Richey: We object to the question as being improper. It is not the function of the witness to interpret the claims, anyway.

Mr. Bruninga: This is just preliminary to another question, because I said I have to make it very plain to this witness or he becomes counsel in the case and objects to the question.

The Master: Is there a question now?

(Question read by reporter.)

(Narrative continued) At this time I do not understand the scope of those claims.

I can't recall the Schoengarth patent; I didn't know the name was in the file. I don't remember the occasion of filing an affidavit to antedate it. I certainly cannot tell you why claims of the scope of those two amendments weren't put into the application before they were put in on those dates.

At this time I have no idea why claims 14 to 28, in the amendment of September 22, 1922, pages 32 to 42, inclusive, were filed nearly five years after the application was filed, rather than earlier.

I remember there was a Long patent involved somewhere, but whether it was Long patent 1,395,441 or not, I don't know.

I remember there was a Hartog-Pomeroy interference, but I thought that came after I was out of the case. The interference appears in the amendment of September 22, 1922, which was signed by me, from the statement as to the Hartog-Pomeroy interference. That may be because I may have been informed of it. I remember there was a Hartog-Pomeroy interference, but that is all, but what pertinence it had here I don't know now. I probably did at that time. I don't know whether I knew about the Hartog-Pomeroy interference when I signed that amendment, because I don't know whether I prepared the amendment or not. I was the attorney of record, and I signed that amendment, if this is a correct copy of it I have before me.

I assume that is a certified copy of the file wrapper and contents of the Patent Office. This looks like it, and

I would say yes, but if I am testifying to prove this document, I would say no, because I don't know whether that seal was put on there at the Patent Office or not. I am not disputing it.

I wouldn't say I have *carefully* refrained from looking into this case or anything connected with it before I came here, because that has nothing to do with it, but I did look into those parts of this case upon which Mr. McCoy said he expected to examine me. He told me he expected to examine me in connection with the time, from the time this was brought to my attention until the application was filed, including the delays in filing the application, if there were delays.

Q. Well, time expired in filing the application, from the time that Mr. Gulick started to negotiate with you, until the time that the application was filed, you understood? A. What time expired?

Q. Until the filing of the application. The time, the period from March, 1916, to November, 1917, if that means anything to you? A. It doesn't. I didn't know anything had expired in that time. I don't know what you mean.

Q. The time that had passed, you were asked to prepare on that? A. Yes, between those dates.

Q. And give any excuse for failure to file the application? A. If you call it that, yes.

Q. But you didn't go any further than that? A. It wasn't necessary as far as I knew, and that is as far as I went.

Mr. Richey: I think it is absolutely immaterial. Of course we will do everything we can. Mr. McCoy will look his files through and Mr. Tibbetts his.

(Thereupon, the witness was excused to Tuesday morning of the following week.)

(Adjournment to following day, Saturday, at 9:30 A. M.)

(At this point the testimony of Jeffries, Record pages 920 to 996, was taken.)

Thereupon, at 1:30 P. M., Tuesday, March 21, 1933, Milton Tibbetts, being recalled as a witness, further testified as follows:

Further Cross Examination by Mr. Bruninga.

I find I wrote Mr. Gulick a letter at the time the application was prepared and forwarded the application to

Mr. Gulick with the letter. I have that letter with me. If the Court orders me to let you see it, I will—it is a privileged communication between myself and client. I think I shall stand on that.

The Master: Of course I can't order him, if it is a privileged communication, I suppose.

Mr. Bruninga: No, there has been a distinction between a patent solicitor and a patent lawyer. This is a matter of a patent solicitor.

The Master: If the ruling of the District Court is, if you can show me some authority so that this witness can be called upon to produce it, I will consider it. When I made the first statement I assumed the general rule applied.

(Narrative continued) I prepared the application for Mr. Gulick, acted as his attorney. I considered myself as attorney for Mr. Gulick in the preparation of the application. He hadn't given me a formal power of attorney then, but the formal power of attorney was signed at the time the application was signed. At that time there was no application of the Gulick patent in suit. Mr. Gulick himself negotiated with the Packard Company, which negotiations culminated in the Packard Company acquiring the application of the patent in suit. He was represented part of the time by Mr. Pond, if you consider all of the negotiations. I did not think I was representing Gulick in part of those negotiations. I would expect that my position as attorney for Gulick began at the time I began the preparation of the application for him to sign. To that extent I was his attorney, which was after the negotiations. I base that on the relationship of the parties at that time.

The application was to be prepared by me, that being part of the agreement between Gulick and the Packard Company, and I did prepare the application and I sent it to him for signature. Among the papers was the power of attorney which was signed by him at the time the application papers were signed, and along with that was an assignment issued to the Packard Motor Company; and that was signed on the same day that he signed the power of attorney; and that immediately divested himself of all legal right, title and interest in the application, the day that he signed my power of attorney. As a matter of fact, I was representing both the Packard Motor Company and Mr. Gulick in the preparation of that application, I would say, because the Pack-

ard Motor Car Company had an interest in it. It is quite usual for patent solicitors and patent lawyers, particularly when acting as solicitors, to include the power of attorney with petitions, and I did this; and, of course, I have done that with all of the applications that I have filed for employees or parties who signed applications for the Packard Motor Company; it is the usual custom. I have done that for years. I don't know whether you would say I was "retained" by the applicant in all of those cases, but I consider myself his attorney.

Q. Who gave the power of attorney to Mr. Gehr in this case? A. What power of attorney?

Q. The power of attorney to Mr. Gehr, I see was given by Cleveland Trust, and the same is true of power of attorney of Mr. McCoy in that application. It wasn't necessary to join Mr. Gulick in that, was it? A. I don't know.

Q. You don't know; you don't know the law on that, do you? A. I don't know that I see why—

Q. You don't even know the Patent Office practice. You know well enough that the Patent Office recognizes the power given by an assignee, don't you? A. That is usually the case.

Q. Well, you know as a matter of fact, as distinguished from law, that the Patent Office recognizes a power of attorney given an attorney by an assignee of an application? A. I think the assignee of all the interest, yes, it is my recollection.

Q. Where did you find that letter that you don't want to produce—in your own file?

(Narrative continued) I found that letter in the file of the Packard Company with that particular application, with the patent drawings. I did not find it in Mr. McCoy's files, but in the files of the Packard Company.

When I testified in this case I didn't make any reservations at all as to my conversations with Mr. Gulick. I don't think I took advantage of the privilege of an attorney when Mr. McCoy asked me questions about Gulick's disclosures to me or Gulick's conversations with me; I don't know of any particular reason why I should.

I know that Packard Motor Company, of which I am an officer, owns a certificate of interest in Cleveland Trust Company, the owner of the Gulick patent.

Mr. McCoy: That is going completely outside of the direct examination.

The Master: Oh, that is all in here. He is an officer of the company. It may be preliminary. The answer may stand and you may have your exception.

(Narrative continued) I can't recall whether I saw the amendment appearing on pages 10 to 15 of the file wrapper and contents before it was sent to the Patent Office. I think I have answered that question before, and I can't answer any better now than I did then.

Q. In order to refresh your recollection I want to call your attention to the fact that both of those amendments differentiate from the Schoengarth patent 1,174,092, a copy of which I hand you, and a copy of which you need not read, but have you seen that patent before? A. I probably have seen it.

(Narrative continued) As I told you several days ago when I was here, I had no recollection of the Schoengarth patent then. I have seen the patent since then. I have a faint recollection of having seen a patent that looked like that, but I have seen lots of patents since.

I am a member of the bar of the Supreme Court of the District of Columbia, the Court of Appeals of the District of Columbia, and the Supreme Court of the United States.

I can't recall whether I have ever had any cases in Washington, in the District of Columbia, or not. My occupation has been that of a solicitor of patents, and partly as an executive of the Packard Motor Company. Outside of that it has primarily been that of solicitor of patents.

(Short recess taken.)

I was admitted to practice before the Patent Office before 1917. That is going back a long ways. Just a minute—I think about 1905. I was admitted to the bar in 1903 and I was admitted to practice before the Patent Office either that year or before. Of course I know that a solicitor before the Patent Office does not have to be a member of the bar.

Q. Now, I want to get clearly before the Master the relation between yourself and Mr. Gulick. Now, Mr. Pond conducted the negotiations on behalf of Mr. Gulick, at least up to the time of May 18, 1917, as indicated by the letter in evidence from Gulick to yourself? A. You are showing me a printed copy of an interference testimony.

Q. Well, you can have the letter before you. I thought you would remember. A. I think that is substantially correct. I certainly wouldn't dispute it.

Q. Well, you had that letter before you when you testified a little while ago. It mentions, "I trust you will give this subject matter your early attention and advise Mr. Pond accordingly, that the subject matter may be properly closed up." Up to May 8, 1917, Mr. Pond was still representing Mr. Gulick? A. I think Mr. Pond represented Mr. Gulick during those negotiations for the purchase of this invention and the other inventions and patents that the Packard Company purchased from Gulick in 1917.

(Narrative continued) My recollection is that the purchase of the Gulick applications, indicated in the March 17, 1916 letter, was completed in August, 1917. Between that date and November, 1917, when the application was filed, I prepared the application for Gulick to file in the Patent Office. At that time I was employed by the Packard Motor Company, on a salary. I was giving my exclusive time to the Packard Motor Company. I wasn't taking in any outside patent business for remuneration, and I wasn't doing any free for friends, that I recall. I can't say whether or not I took out any application for anybody except for or on behalf of the Packard Motor Company, during 1917, because I don't recall any. I don't recall any applications which I had taken out one or two years on either side of 1917 for or on behalf of anybody else than the Packard Motor Company, but I know I have prepared and filed applications for others during my employment by the Packard Company, for friends and others, practically all without remuneration, some few with.

I don't remember having said that I put a week on the preparation of this application for Mr. Gulick, but I think probably I did. During that time I drew my pay from the Packard Company. The Packard Company, as assignee, through me had control of the Gulick matter, this Gulick application, during that period on account of the existing contract. I sent the application and the assignment to Mr. Gulick to sign and he executed the application, including the power of attorney and the assignment, on the same day. The applicant's name is almost universally put on the drawing, and I think was in this instance. It was in this instance, as can be seen from the enlargement which Plaintiffs' coun-

sel has produced, which satisfies me the name, Mr. Gulick's name, was placed on that drawing. It is generally done even though the application is on the same day assigned to an assignee; I don't think that controls at all. It is a matter of custom for the applicant to appoint an attorney, not a matter of convenience.

Q. It is a matter of custom, it don't establish any relation of attorney and client between the applicant and the attorney who prepares the application in behalf and for the assignee, does it? A. I can't answer that. I think that is a matter of law. I would say that it did.

Q. But you have never considered yourself as an attorney for any of those applicants, have you, after it was assigned to the Packard Company? A. I considered myself an attorney for all of them, undoubtedly attorney of record in the Patent Office.

Q. And you would have taken care of Mr. Gulick's interest adverse to the Packard Motor Company on account of the appointment by power of attorney? A. They weren't adverse.

Q. But if a situation would have arisen where Mr. Gulick would have refused to execute that assignment, you would still have filed the application and proceeded?

Mr. Richey: The plaintiff is on the side-lines in this matter, but we have a right to object to building up a lot of record here.

The Master: I think not. This man has refused to produce this letter, and he is being inquired concerning it. You have produced this witness and it seems to me it is proper cross examination.

A. That is a moot question which I can't answer. I don't know what I would have done at that time, but I might add if he would not have signed the application I couldn't have proceeded with it.

(Narrative continued) Of course I could have proceeded with the application if Gulick had signed the application but had not signed the assignment. I don't know whether I would have gone on with it in that event.

My relations with the Packard Company, of course, were such that I could have proceeded with the Gulick application, filed it in the Patent Office, and represented him adversely to Packard Motor Company. I don't know what I would have done in that respect. I can't answer that yes or no, either way; I don't see why I could not.

Q. You have stated on direct examination that after a period of time covering the negotiations and so forth, and disclosures of Mr. Gulick, that you proceeded with the filing of the application, that the matter was delayed on account of the Liberty Motor design, and that you finally sent the application to Mr. Gulick to sign. You testified to that on direct examination? A. Yes.

Q. But now you take the position that the letter of transmittal of the application is a privileged communication, is that right? A. I think it is, and I don't see any reason why I should show it to you.

Mr. Bruninga: I am ready to have the Master rule on it.

(Thereupon, argument was had by counsel for the respective parties; counsel for plaintiffs citing decision of the Supreme Court of the United States in *Chirac et al. vs. Reinicker*, decided in 1826 reported in *Wheaton*, Vol. 11, page 278, at page 477.)

The Master: If the witness wants to insist still further on this privilege, I will take a little more time and examine the question to satisfy myself.

The Witness: May I say I would like to have you do that. I will say that for this reason, if I may do so, I came down here voluntarily as a witness connected with the interim, the time between the beginning of these negotiations and the filing of the application. I think I have responded, both to cross examination and direct, on that; but from that point on, where the defendants' counsel has asked me to go into my records on matters that don't concern in any way that time interval, I just don't like to release my privilege, that is all.

(Further argument had by counsel, counsel for defendants citing *Jones on Evidence*, Third Edition, page 1165, and case thereunder 128 U. S. 464.)

The Witness: Before you make a ruling, may I make a statement?

The Master: Certainly.

The Witness: In this particular matter at that time, at the time in question, in the fall of 1917, I was counsel for both Gulick and for the Packard Motor Car Company. I am still counsel for the Packard Motor Car Company. These files belong to the Packard Motor Car Company. This particular communication that is in controversy here is, as

you know by having read it (the witness having previously shown it to the Court), not of a great deal of importance in all probability, but if your ruling is that this must be produced here and shown to defendants' counsel, it will mean also that the other communications will have to be produced, presumably, and in many of them there are references made by Gulick and by me to other patents, other inventions which have nothing to do with this case, and which I do not want, and I don't believe Gulick would want, spread on the records of the Court, where they become public, and I can't see why I should divulge this evidence, these communications, without the consent of Gulick and without the consent of the Packard Company; and on behalf of the Packard Company, as an officer, I will not give the consent.

Mr. Bruninga: I want to say right here I don't want any communications as to any other inventions except this one. I have no desire or, that at all, but answering Mr. Tibbetts, there is another proposition: the Court can pass upon the matter piece meal. For instance, if this particular letter is proper to be received, the Court can then determine whether the others can be received, in succession, that is the way I understand it.

The Master: Well, as I believe, on such examination now as I have been able to make, Mr. Bruninga, the rule of practice is that this communication should not be received unless there is a waiver, as Wigmore says, on behalf of the client. Now, the client in this case is either Gulick or the Packard Motor Car Company. I am not at this moment determining which it is. But Jones states the rule in this way, in this edition that I have, section 469, "For the privilege to exist it is sufficient that communication has been made by the client to his legal adviser for the purpose of professional aid with respect to matters in which such aid may be properly given and in respect to which litigation may properly arise." Now, further, this seems to be borne out by some examination in the short time I have had as I have been able to make of Wigmore, and the discussion of this appears in Section 2323 in this edition which I have before me, and which covers a page or two and is to the same effect as the rule stated in a few words in Jones. And in

view of the case we have before us, this *Brunnager vs. Smith*, which limited it to solicitors, I don't feel that at this time I could permit the admission of the document, of the letter. If, on further examination before this trial is over, you can find other authorities and want to present the question again, I will be glad to entertain it, but at this time I will sustain the witness in his refusal to produce this letter.

Mr. Bruninga: Your Honor understands, of course, this witness is an officer of the Packard Motor Company who passed title to the patent in suit.

The Master: I understand that, and this witness was acting in part for such Packard Motor Company, as its attorney, in preparing the application, too, I think, although the application was signed by Gulick himself.

Mr. Bruninga: I admit he was acting on behalf of the Packard Motor Company.

The Master: So we will let it stand there at this time. If you find other authorities you want to present I will be glad to entertain them.

Mr. Bruninga: Of course this is one case where I cannot make an offer under the equity rule because I don't know what the evidence is going to be. Your Honor will grant me an exception in this case.

The Master: Yes, you may have it.

(Narrative continued) I have known Mr. Gulick since about 1908 or 1909. I don't think I have been his attorney in any other case prior to that time. I don't recall his ever telling me about a piston in 1908 or 1909. I learned about the particular piston in Exhibits 36 and 37, the original description and the sketch, some time before my letter of March 27, 1916. I can't say how long before, because as I have stated before, Mr. Gulick has discussed with me, and all through that time discussed with me, a great many of his inventions; whether he discussed this one or not, I don't know.

Q. I believe you stated on direct examination that Mr. Gulick's idea of the negotiation and the closing of the negotiation was that he wanted to sell all of his inventions or nothing; in other words, he didn't want to split them up, so much for each one? A. All of that group, yes.

Q. Now, turn to page 131 of the record in the interference proceedings in which you testified, and near the end of page 131 you testified as follows: "Shortly after that March agreement was made it turned out that Gulick was unable to get title to these patents and consequently he could not go through with the agreement. Later he was able to get some of the patents and not others, and he was able to get some additional patents that had been owned by the Amplex Company, and he made a revised offer of sale to us. As I recall it, there were still additional changes in the line-up of patents and inventions made from time to time as the negotiations progressed and as the receivership or bankruptcy proceedings of the Amplex Company were carried on, but always this piston invention of the blueprints, pencil drawing and description referred to in my previous answers were a part of the subject matter involved." The reference is to the exhibits which are now 31, 32, 36 and 37. What did you mean there by "he made a revised offer of sale to us"? A. As he found that one or two patents couldn't be obtained from the receivers or whoever it was that owned them, he made a group offer omitting those, and in other cases he was able to add some patents that he was able to get hold of or expected to, he added those to the group.

(Narrative continued) Mr. Gulick was compelled to make a revision of the contract by reason of the fact he couldn't get all of those patents in one group. He was apparently willing to do that.

I don't think I could have gotten this piston application alone in March, April or May of 1916, because he wanted to sell all of them together, as many of them as he could get. I think the language in my testimony in the interference indicates that he wanted to stick to the whole or nothing. He was compelled to take some of them out because he couldn't get them. He still wanted to sell all of them.

Referring to page 301, which contains the letter of December 24, 1916, which is in evidence, (witness comparing numbers) the letter of December 24, 1916 included the four patents referred to in the letter of March 27, 1916, and it also included five other patents. It is my recollection that those were additional patents to the matter in the agreement of March 27, 1916. Apparently Mr. Gulick was able to carry out his delivery of the patents and applications mentioned in the letter of

March 27, 1916, as it stood as of December 4, 1916; but here also he says that he prefers to dispose of all of them, which simply carried out what I have stated before. He says he preferred to; he doesn't say he insisted upon it, because he has added five additional patents, five other patents. As far as that agreement of March 27, 1916, is concerned, I would say that Mr. Gulick was ready on December 4, 1916 to deliver title, excepting that he doesn't mention the invention referred to in the letter of March 27, 1916, although he refers to the letter itself. I know of nothing that prevented Mr. Gulick from delivering the slide valve motor and the motor piston and the double-acting air cooled motor piston, mentioned in the letter of March 27, 1916; I think his intention was to include all of them in this offer of December 4, 1916.

Referring to page 303, the letter of May 18, 1917, Mr. Gulick had been in somewhat of a hurry all along up to that time to close up the matter. The delay between December 4, 1916, and May 18, 1917, was caused because it took some time for us to get together, which we did in February, 1917, in Chicago, according to my letter of February 28, 1917, which is on page 302. And apparently we were then waiting for Mr. Rector to approve the title, and that I remember quite well. Mr. Rector and Mr. Pond were working on the title papers to see whether Gulick would deliver a good title to all the patents and applications involved.

I don't remember whether Gulick was right when he said on May 18, 1917, "I believe the assignments are all straight"; they were right later. The matter wasn't actually closed up until August. In other words, it took from December 4, 1916, to August, 1917, to get the matter concluded. It was a matter of about eight months between December, 1916, and August, 1917, but a number of things were done, as my letters that I have referred to explain, and as I have explained, the matter of getting title fixed up, it wasn't a delay without action, if that is what you mean.

I know that the matter of title was not straightened up at the time I received that letter of December 4, 1916. I don't know whether he was able to deliver title or not, but the title had not been approved by Mr. Rector, and therefore it was incomplete so far as I was concerned.

I admit there was a period of almost a year, between December 4, 1916, when Mr. Gulick stated he was ready to deliver title, until November 30, 1917, when the appli-

cation was filed in the Patent Office, but I don't say it is unexplainable, because as I have explained to you several times, and I think on direct examination also, there were a good many things that had to be cleaned up. The receiverships, which Mr. Gulick has referred to, and which I referred to, which the letter referred to, made a very complicated title, took a long time to do it, and it took some time for Mr. Rector to act on it. Mr. Rector was extremely busy, as Mr. Gulick points out in his letter. I see no necessity for further explanation on the delay during the period of one year in closing up the title and filing the application.

I don't know what period I had in mind when I testified in the interference, page 133 of the record, as follows:

"*Shortly after the consummation of the purchase of the piston invention* and the other inventions and the patents involved, a file was made in my office and this case with others was before me for preparation of the application. Shortly thereafter the application was prepared, the drawings made, and the papers sent to Mr. Gulick for execution. They were returned by him and filed in the Patent Office. All of this was in the fall of 1917."

I don't know whether or not I traveled back and forth to Washington between August and November, 1917. I don't think Mr. Vincent had returned to Detroit in June, 1917, but he may have. He went back and forth a good deal.

I don't know whether the first Liberty engines were built as early as the fall of 1917 or not.

When I testified, on page 134 of the record of the interference: "During that summer and fall the first experimental Liberty Engines were built by the Packard Company and all of us here were working feverishly to get these first engines built," my recollection seems to have been better then than it is today. When I said "here" I meant Detroit. I was not necessarily in Detroit all of the summer and fall of 1917. My headquarters were always at the Packard Company at Detroit during that period.

I have not looked up how many patent applications the Packard Company filed between August and November, 1917. I never thought of it.

Mr. Bruninga: I would like to have the privilege, then, of filing copies of such patents as I may

be able to find whose filing dates are between August and the 1st of November, 1917.

The Master: By whom?

Mr. Bruninga: By the Packard Motor Company. If I can obtain them from the record.

Mr. Richey: File a list of them, it will be just as well.

Mr. Bruninga: Yes, if you are satisfied with the list, Mr. Richey.

Mr. Richey: All right, no need to clutter up the record with a lot of patents.

The Master: Such document will be received.

(Narrative continued) I stated that the Packard Company was a holder of a certificate of interest in the trust estate. As an officer of the company I am interested in upholding the Gulick patent. I am a stockholder of Packard. The records show that that application of the Gulick patent in suit was assigned to Cleveland Trust Company on September 11, 1922. I don't remember the exact length of time over which those negotiations extended, but it was some months. I was instrumental in making that deal.

It is difficult for me to say whether I approached the Cleveland Trust Company or the Cleveland Trust Company approached me in that deal, because I can't recall just how it came up. My recollection is that it first came up through an attorney for one of the parties to the subsequently formed trust, and after that I can't remember whether I approached the Cleveland Trust Company or the Cleveland Trust Company approached me.

When I prepared that application for the Gulick patent in suit, I don't say that I knew the piston art, or that I do now. I had seen some patents on pistons and prepared and drafted applications for some patents on pistons, but that is a long way from knowing the piston art.

I don't know whether or not I prepared the application for the Vincent patent 1,279,184. It was prepared in my office.

Q. You put into that application all of the disclosures Mr. Gulick gave you—into the Gulick application of the patent in suit, I mean?

Mr. Richey: It seems to me we went over this the other day. We are repeating the same ground and therefore immaterial.

The Master: He may answer.

The Witness: I put in as much as I thought belonged in a patent application.

(Narrative continued) I don't remember whether or not I told Mr. Doolittle, my assistant, what Mr. Gulick had disclosed to me, to enable him to prepare amendments. Neither do I remember telling Mr. Hanley what Mr. Gulick had disclosed to me. The presumption is that I told him enough to prepare the amendment on it.

Q. I notice that by looking at the file wrapper and contents that there was a delay between the first office action, or rather the supplement to the first office action and the first amendment of approximately nine and a half months; that there was a delay between the first official letter and the second amendment of approximately ten and a half months; then there was a delay of about eleven and a half months between the official letter of November 19, 1920, and the amendment of October 31, 1921; but that there was then sudden activity on December 24, 1921, as shown by page 24 of the file wrapper and contents, there was a supplemental amendment filed, adding additional claims, and the supplemental oath. Can you explain that sudden activity? A. No, and I don't know that it needs explanation particularly.

Q. You may not think it needs explanation. A. Right.

Q. But your answer is that you don't know what the sudden activity was? A. I don't recall it now.

Q. I notice that the amendment of October 31, 1921, is actually dated in your office November 29, 1921, and that the supplemental oath is dated December 2, 1921. Also that the Long patent 1,395,441 issued on November 1, 1921. Was the issue of the Long patent on November 1, 1921, any reason for that sudden activity? A. It is quite possible that it was, but I don't recall it.

(Narrative continued) I doubt very much if I ever had seen one of the Long pistons at that time.

There are a lot of things tried out experimentally in the Packard cars. I do not keep track of outside matters of that sort in connection with experimental work. Sometimes I see them, sometimes I don't. I don't recall the Long piston at that time. I have seen the Long patent 1,395,441, but not necessarily at that time.

I can't recall now who prepared the amendment of September 12, 1922, although I know that I signed it.

Q. The Patent Office records show and the exhibits in this case also show that in a certain interference of Hartog vs. Pomeroy, involving an application of Aluminum Company of America, the final hearing was set for January 10, 1922. On February 17, 1922, there was a decision of the Examiner of Interferences in favor of the Aluminum Company of America's applicant, Mr. Pomeroy, and on August 30, 1922, there was a decision of the Board of Appeals reversing the Examiner of Interferences, in favor of Mr. Hartog and against the applicant Pomeroy of Aluminum Company of America. Do you have any information as to that at all, having in mind that the amendment of September 12, 1922 was prepared about 13 days thereafter, and the assignment to the Cleveland Trust Company is dated about 12 days thereafter? A. I don't recall any of that.

Q. Well, as a matter of fact, the records show, the file wrapper and contents show, however, that on October 31, 1921, the time that the amendment was filed in the Patent Office as indicated by page 20 of the file wrapper and contents, you took personal charge of the application after it had been previously prosecuted by Mr. Doolittle and Mr. Hawley. Can you explain that? A. If it needs explanation, yes. I did as I frequently do in cases, if I want to pick up and amend, I do so, if I want somebody else to amend it, I ask them to do so, depending on how the work stands in our office and whether or not I am particularly interested in this, that or the other case.

(Narrative continued) I know Mr. Gunn very well, but I don't remember his article in Automotive Industries of January 29, 1920, which on page 363 disclosed the Long piston; I may have seen it but I don't remember it. I may have known about the pendency of the Long-Hartog interference, and the Hartog-Pomeroy interference. I am saying I do not remember those things now. At the time I may have been cognisant of a number of these things. I may have seen the Long patent as it came out. I tried to follow the Gazette as it comes along, but I can't remember anything about that patent except that I have seen it from time to time.

At the time the amendments of October 31, 1921 and December 24, 1921 were prepared, I don't know whether or not I was familiar with the piston being used in the Maxwell car of the character shown in the Maynard patent 1,655,968; I may have seen it. I may have seen it

in the magazine, if it was in there, if the patent had issued. But I have seen so many pistons and piston patents that I certainly cannot remember that particular one.

Referring to the supplemental oath dated December 2, 1921, which is on page 21 of the file wrapper and contents, and particularly to the statement "said invention was incorporated in an automobile engine and successfully operated in the United States prior to the month of October, 1915," I found that I had some correspondence with Gulick, and in that correspondence I found statements by him from which I prepared this affidavit, and then I sent it on to him and he executed it. I have that correspondence here with me, but I am not willing to produce it; it contains several matters outside of the pistons. I doubt very much if I could cover up that portion of the letter which relates to other matters.

Q. I want you to understand, Mr. Tibbetts, that I do not want any confidential invention between Mr. Gulick and Packard Motor Company outside of this piston, and if there is any way you can arrange to take out of that letter before the Master, or let the Master do it under your direction, parts which do not relate to this piston, I will gladly accede to it. A. I think I will have to take the position that the entire communication is a privileged one.

Q. Including this matter of what evidence you have relating to, that the invention was incorporated in an automobile? A. I think that is particularly privileged, yes. The affidavit speaks for itself.

Q. The affidavit does not speak for itself, Mr. Tibbetts, that is just your own personal opinion. It indicates that a piston of the construction shown in that blueprint has been used in an engine which Mr. Gulick now says never happened? A. That is probably your opinion.

Q. And I cross examined Mr. Gulick about it and he said he didn't have the records and he didn't stand on any privilege, which counsel or the Master can tell you, still you stand on privilege and don't want to communicate anything? A. Yes.

Q. And in spite of the fact that Packard Motor Company is a predecessor in title to the Gulick application in suit? A. Yes.

Q. And in spite of the fact that the Packard Motor Company owns 700 shares in the trust estate? A. I am not sure of the number of shares.

Q. But it owns a substantial number, does it not? A. Not very.

Q. Well, the records of the Court of it show it owns 700 shares. But you still stand on privileged communication? A. Yes.

Q. In other words, you don't care to be checked up, do you, even as to the matter relating to the Gulick piston? A. If it can be called that, but those are your words and not mine.

Q. Did you have any knowledge of the so-called 1911 and 1914 pistons of Mr. Gulick at the time that this affidavit was prepared? A. You mean personal knowledge; of course, I didn't.

Q. Did you have any information at the time it was prepared? A. Information as to what?

Q. As to the character of supposed Gulick 1911 and 1914 pistons? A. I certainly had knowledge of what I assume you refer to as the 1914 piston, because that is the date of the blueprint which Mr. Gulick left with me in March of 1916, but as to what you mean by the 1911 piston, I haven't followed the testimony close enough to identify that.

Q. Well, I will ask you this question: Is the web piston shown in Exhibits 36 and 38—those are the original sketch and the blueprint—is the web piston construction, is that the only type piston that was disclosed to you by Mr. Gulick? A. Oh, no, Mr. Gulick showed me a number of pistons, a number of different types of pistons.

Q. A number of different types of pistons? A. Yes.

(Narrative continued) I, of course, mean that Mr. Gulick showed me the drawings of the pistons. I don't recall if they were actual drawings or sketches; probably both. I recall one in particular because I happened to see it when I was looking over some of these other papers the other day. I saw a blueprint of one of his pistons, which had nothing to do with this, but merely answering your question, I say I saw it. It has since been patented, and the patent as I understand it has been purchased by the Trust. I don't know the number of it. I could give you a description of it, if that will help you any. It is the piston of patent 1,337,538.

I don't recall now whether or not Mr. Gulick disclosed any piston outside of the particular one shown in the Gulick patent 1,315,733, prior to the time of the filing of the application in suit; he may have, because as I say he talked with me about so many of his inventions, if he had any others, he probably showed them to me. I don't

know whether he disclosed a piston to me that didn't have the wrist pin bosses on webs, like 17 and 18; he may have.

I don't know whether you would call, what Mr. Gulick told me before I prepared that affidavit of December 2, 1921, disclosures, but he told me he had made a piston of that claim prior to October, 1915, I think the date was, the date referred to in the affidavit, which was the date of filing of the application of the Schoengarth patent 1,170,092. I never took occasion to find out if Mr. Schoengarth probably had constructed anything previous to the filing date of that application. Of some of the things I have very good recollection because I have refreshed it from the files themselves, and on these things of whether they are the same or similar to a lot of other applications, it necessarily is faint. My memory has been refreshed on the amendments I have filed and the facts I prepared the application itself, and those are the initials on it. My memory was so fresh on Exhibits 36 and 37, the original sketch and description, that all I did was look at it and say, yes, that is what I saw, because I have seen them a great many times and I testified about them before. That is also true of Exhibit 32.

Q. But when it comes to the matter of an amendment involving important claims, you don't have any recollection of that? A. Because some of them I had nothing to do with except to sign them.

Q. Even though you signed, your memory is faint on that? A. I don't recall any such amendment.

Q. You don't recall any amendment you prepared; your memory isn't very fresh on that? A. I think so. I think I testified fairly well as to those particular amendments.

(Narrative continued) You may call my memory refreshed, but not fresh. I came here at the request of plaintiffs, and it was not necessary to subpoena me.

Mr. Bruninga: Cross examination closed.

Re-Direct Examination by Mr. McCoy.

Mr. Bruninga: I understand you won't rule on the production of these letters different than you have?

The Master: It will be the same ruling at this time.

Mr. Bruninga: How will the matter work out?

The Master: I said if you had anything further to submit and satisfied me that the rule was otherwise than I have indicated, before the case is closed, I will permit you to recall this witness.

Mr. Bruninga: In other words, he is still subject to call before the Court?

The Master: Yes.

Mr. Bruninga: So I understood.

(Narrative continued) The only explanation I can give of the time interval that transpired between the receipt by my office of the actions from the United States Patent Office and the filing of the several amendments that have been called to my attention, is that it was done in the usual course of business. There was certainly no undue delay. Most cases at that time would run from eight to ten or eleven months before we amended. That was quite the usual thing at that time in the office, when we had the number of cases we did in the office. When we were up to date at that time it even took six months, even if we would catch up. Even at this time it is four or four and a half months. That is quite the usual thing with my office as it is with everyone else's.

Mr. McCoy: That is all.

(At this point the testimony of Jeffries, Record pages 999 to 1027, was taken.)

(At 1:30 P. M., Wednesday, March 22, 1933, the following proceedings were had:)

(Thereupon, the defendants called as a witness, out of order, in surrebuttal, WALTER L. SCHOENGARTH, who, being first duly sworn, testified as follows:)

DIRECT EXAMINATION by Mr. Bruninga.

My name is Walter Schoengarth. I now live in Chicago, and before that I lived in Ironwood, Michigan. I came to Ironwood in the summer of 1912. I was born in 1885. I was in Ironwood, Michigan, very nearly all my time from 1912 until I moved to Chicago; I moved once to Hurley, Wisconsin, which is about a mile from Ironwood, just across the boundary line, and then back to Ironwood. I just moved to Chicago a week or so ago.

When I came to Ironwood, I started in automobile repairing work, for Harry Barr. He ran a garage, and his business was automobile repairing and selling machines. He first sold the Ford and then the Cadillac,

and the Overland. He handled Fords right from the start.

My work there was repairing cars, and finally I got to be foreman, shortly after I come there. I stayed with Mr. Barr until he sold out to Gale. I am not certain as to when that was; I think it was possibly in the early part of 1917; it may have been in the fall of 1916.

My experience previous to working for Mr. Barr, which qualified me to repair automobiles, was:—I did some stationary repairing on gasoline engines and had quite a bit of experience on steam engines, locomotive and stationary engines, and ran a locomotive at one time.

I became familiar with pistons before I went to work for Mr. Barr. That experience involved taking out, repairing and replacing pistons in automobile and stationary gas engines; I wouldn't say that included the Ford car so much. I did some of this work after I came with Barr.

I am the Walter Schoengarth who took out the Schoengarth patent 1,174,092, and that patent was granted to me. The attorneys who assisted me in securing that patent were Louis Bagger & Company, as shown on the drawing of that patent.

Previous to that patent, that concern assisted me in securing a reamer patent.

During the last month I have had some correspondence with that patent concern. I wrote in for some literature or information with reference to that patent 1,174,092, and they sent me some.

Q. I want to call your attention to a letter, original letter dated May 4, 1915, addressed to Louis Bagger & Co., and signed Walter L. Schoengarth, which I will mark for identification as Defendants' Exhibit 5-K1; do you recognize that letter? A. Yes, sir.

Mr. Bishop: Before you ask any more questions I would like to repeat my objections that this is not set up in the answer, and make an objection it is not proper surrebuttal testimony.

The Master: Same ruling on that.

I know Mr. Watts, who is in this room. I imagine I met him probably a month ago at my home. He came over there to see if he could get some information with regard to the patent that I had received. I had a complete conversation with him, and I talked freely with him. I did not try to hold anything back. I also talked

with Charley Garland and Edmond Stenstron, and another gentleman there. I couldn't say what date that was.

Mr. Bruninga: Is Mr. Watts willing to tell me what date that was?

Mr. Watts: Well, I would if I could. I can tell it by looking it up.

Mr. Richey: February 15th, wasn't it?

Mr. Watts: No, February 16th, of this year.

(Narrative continued) Another gentleman with with him. I do not know the man's name.

Mr. Richey: A. E. Redner, superintendent of the Ironwood Mine.

(Narrative continued) That was before you (indicating Mr. Bruninga) ever met me. You had, however, had a long-distance telephone conversation with me.

I recognize Exhibit 5-K1 as a letter I wrote on the day I have it dated, marked May 4, 1915. That letter reads as follows:

"Enclosed find $5.00 for first examination on invention which I call the adjustable piston. I am sending you model by express. Hoping it will be all O.K., I remain, yours truly, Walter M. Schoengarth."

I presume the model referred to in that letter was sent by American Express. I do not know where it is now. That model was constructed just like the constructions shown in the Schoengarth patent 1,174,092. The one that I sent was a wooden model, and I made it because I understood you had to make models with patent drawings in order to obtain a patent, to make it clear.

The "202 Frederick Street" was the place that I resided at that time. The postcript reading, "You will also find sketch and write-up on the same" was put on after I wrote that letter. Such a sketch was sent.

I made that tracing, Defendants' Exhibit 5-K2. I was able to make drawings in those days. I learned that when I worked as a rod man and transit man on the Soo Line, about 1917 to 1921. I finished that drawing, I presume, the day I made the date there, i.e., May 7, 1915.

That three-page description, marked Defendants' Exhibit 5-K3, is in my handwriting. I have read that description recently, and it refers to this drawing 5-K2,

I sent the drawing, or sketch, 5-K2 in a few days later than I wrote the letter of May 4, 1915; I must have held this letter for a few days until I had this drawing completed. The sketch 5-K2 and write-up 5-K3 are the ones referred to in the postscript of that letter.

Mr. Louis Bagger sent those three papers, 5-K1, 5-K2 and 5-K3, to me recently, at my request.

I remember receiving a letter, a carbon copy of which is attached to 5-K1, dated May 13, 1915, and which is marked for identification "Defendants' Exhibit 5-K4." I do not know where the original is, but I remember the contents of the letter.

The letter dated May 20, 1915, and marked "Defendants' Exhibit 5-K5" is in my handwriting. That letter states:

"Enclosed find $20.00 for preparation of papers on execution."

That $20.00 mentioned was the $20.00 asked for in Bagger & Company's letter of May 13, 1915, Exhibit 5-K4. I wrote that letter 5-K5 on the date thereof.

I remember receiving the original of the letter marked "Defendants' Exhibit 5-K6," which letter asked for $20.00. I do not know where the original of that letter is.

I wrote the letter dated July 29, 1914, which should be '15—I made a mistake. This letter is marked "Defendants' Exhibit 5-K7." That letter is in my handwriting, and it couldn't have been written in 1914. I have made mistakes in dates occasionally, and I suppose I made that error there.

I remember receiving the original of the letter dated August 5, 1915, and marked "Defendants' Exhibit 5-K8," which refers to my letter of the 29th ult., which is 29th of July, 1915. I am quite sure the date on 5-K7 should have been 1915.

(Short recess taken.)

That is my handwriting on the certified copy of the petition, certificate, oath and drawing as originally filed, of the application which matured into Schoengarth patent 1,174,092 (Defendants' Exhibit 5-K9). That is my handwriting above the oath and at the bottom of the oath.

That oath is dated the 27th day of July, 1915, and my letter of transmittal in which I sent the Post Office

money order for $35.00 has the date of July 29, 1914. That latter date should have been '15. That letter states:

"Enclosed find Post Office money order for $35.00 for patent execution on adjustable piston, also rough drawing showing adjustment. You need not change reading of execution papers only show in drawing that abutment is threaded to stud, also to end; the lug has a plain drilled hole; otherwise, O.K., am well pleased. Hoping to hear from you soon, I remain."

That adjustment I referred to in that letter is the one shown on the little sheet attached to the larger sketch. They didn't get that clear on this large sheet here, and I showed them again this was supposed to be threaded into that boss and a plain hole drilled through here. The studs were supposed to be threaded into the piston. The lugs with the studs threaded through were larger; they were free so they would slide through there.

The part sketch drawing is the one marked August 5, 1915, on Exhibit 5-K2.

Mr. Brumingo: I offer in evidence Defendants' Exhibits 5-K1, 5-K2, 5-K3, 5-K4, 5-K5, 5-K6, 5-K7, 5-K8 and 5-K9.

Mr. Richey: Insofar as they state facts which have not been proven otherwise than by the letters, we object to them as containing hearsay.

The Master: They may be received with the same reservation.

(Narrative continued) Charley Garland and I made that wooden model that I referred to in my letter of May 4, 1915, Exhibit 5-K1. I remember that model.

I made an actual metal piston of the character as shown in the patent 1,174,092, at the shop where I worked at Ironwood, in the spring of 1915. That was some time before the letter of May 4, 1915, transmitting that wooden model. As I stated before, the reason I made that model was because I thought it necessary to have a model for the Patent Office, to obtain a patent.

We made up four of these metal pistons for a model T Ford truck, owned by Sullivan & Cumbe, who ran a grocery store. Mr. Cumbe is dead, but Mr. Sullivan is still living. These pistons were no different from the piston shown in my patent 1,174,092, except that we left out that adjustment in the pin; that could be either with or without; that had nothing to do with this, it was just a

straight ordinary brass bushing. We didn't change the wrist pin bearing at all; we used this adjustable arrangement shown in Fig. 4 of the drawing. We used a Ford cast iron piston of standard dimensions, and welded the bosses in with an electric welding torch—or acetylene welding torch, rather. We welded on the boss D and the boss F. We then drilled right through both the lug F and the boss D, and threaded the boss D. I drilled a hole through the skirt at the bottom and at the top. At the top I welded on the lug C, and also the lug E. Then I bored right straight through. I also made a tap hole in the boss D.

We screwed the bolts 5, in Fig. 5, in with the nuts on them, and made the proper adjustment so we could make that larger—they were probably worn pistons—we opened them up so they would fit the cylinder wall. The upper slot 3 came from where it was shown in Fig. 1 to the other side, just about the same distance. The slot 4 was diagonal. It started from the top center and ran down around to the side, I don't know whether the right side or the left side, but down around to the side. It started about the center, where it would correspond to the upper adjustment, otherwise if it was through there we couldn't put that in. We adjusted them to the cylinder so they would fit, so they tumbled.

After we had placed those four pistons in the delivery truck of Sullivan & Combs, they ran it for a time and we watched it, oh, possibly five months, four or five months, and discovered that a real lot of noise developed, and discovered by taking the head off and the bottom off and taking the pistons off and examining it, one of these lower, this lower angle broke away. I mean in Fig. 2 the corner to the right of the section line 3-3 at the bottom. The other three pistons were running all right.

We were paid for the labor and time we put in making those pistons. It was in the spring of 1915 when we put the first set in. That was before I first wrote Bagger & Company on May 22, 1915.

Charles Garland, who helped me with that job, is at Ironwood, Michigan. I talked with him recently over the phone. I knew it was him because I know his voice, I heard his number called, and I talked with him personally. He is not in good health at present.

Q. What did he tell you?

Mr. Richey: I object to that as hearsay.

Mr. Brunings: Oh, no, that is not hearsay. I am trying to excuse why this witness isn't here.

The Master: I don't think you can do it by hearsay. He can tell what he knows about his health.

Mr. Richey: I know, if it is not hearsay, I am not objecting to what he knows of his own knowledge. I am objecting to what he was told.

Mr. Brunings: Suppose a man tells you, "I am not well."

The Master: I think he may answer to that extent.

Q. What did he tell you as to the state of his health, that is all? A. He was operated for hemorrhoids and he couldn't come. I asked him to come.

After we put those four pistons in the Sullivan & Cumbe Ford, I suppose we inspected them three or four times. I wouldn't say that we inspected them more than once, but I know when that noise developed, the time we made that other change, why, we discovered that piston broken. By "other change," I mean I put in a piston of the ordinary 1½ oversize, one and a half thousandths, that is, fifteen ten-thousandths, and sawed a slot clear across, the slot 3. We also made slot 4 almost perpendicular.

That slot 3 was almost all the way around, that is, one-half of the sphere, just as far as shown in Fig. 2, and in about the same position with respect to the bottom ring land.

That slot corresponding to the slot 4, started at the top center. It curved around just a trifle; we sawed it straight down, or almost straight down. We put a little slant in it to avoid a groove worn in the cylinder wall.

There were high spots in that one and a half oversize piston, particularly above the numerals 3', and around here down the side of the cylinder along near the wrist pin bosses, where we couldn't get it down through, I filed away. That particular piston does not have those adjustments in them that you see in Figs. 2 and 3. We put that in without the adjustments. It was actually put in the cylinder in place of the broken one. It had a tight fit and I used the general method that they used those days by using a grinding compound and lapping it in.

After that piston was in the car, the car was run. It probably ran for a year or better. I got paid for that job. That was, I think, about five months after the adjustable pistons were put in. It was in the fall of the year, because we had no leaves on the trees, but we didn't have snow. The time snow falls in Ironwood varies. I suppose we get snow in September to about the middle of October and the last of October, and it stays on the ground until the first of November, as a rule. In the middle part of November the weather is cold with quite a bit of snow.

I am sure it was before snow was on the ground that this slotted piston with the vertical slot was put in. That same year we put in a piston with the adjustment.

We filed the piston on both sides, in the region of the wrist pin boss, and we had to file it away around the part that is above the slot 3. I am quite sure we couldn't have gotten it in with fifteen thousandths over-size unless we had done that. We couldn't get a piston bigger than the hole in the cylinder without filing, especially where the lower part of the piston travels. The top of that piston was smaller than the skirt. That was the general practice in those days.

It was a new thing to file the piston to relieve it on the side opposite the wrist pin bosses, but we had used it around there occasionally; we had to use it at times. We had no means of re-boring and we had no machine for re-boring; so we lapped in our pistons. We discovered that by lapping them in we got a more or less funnel-shaped cylinder anyway by the time we got our piston down to the bottom; so we took the pistons and split them and ran something inside of them and put on the connecting rod, reversed on the connecting rod as it came out of the piston, and lapped our cylinders through that way. The slanted split shown in the drawing of this patent 1,174,092 is very easy to be explained; we had no means of putting adjustment in here without the connecting rod interfering with the lower adjustment. If we had made the slot straight and put that particular adjustment on the sides, the connecting rod would either bend or buckle up, or smash up the machine.

In the description, 5-K3, where it says: "Slot 4 is cut diagonally for two purposes: first, to prevent scoring; second, for convenience of getting at the upper and lower piston adjustments," we could not have placed that adjustment on the thrust or non-thrust side.

In explanation of the statement: in the description, 5-K3: "The piston is to be placed in motor as shown at motor view; this being for the purpose of keeping solid side of piston on explosion wall or the side of cylinder where the explosion or combustion forces piston against cylinder wall when on the power stroke, looking from the front slot on the right side. See view on motor view at right side of sketch" as the crank shaft rotates and the explosion occurs it shows, looking at it from the front, the thrust bearing is on the right side, on account of the angularity of this crank pin. I always thought that if that was slotted, that would be the proper way to install it.

We put adjustments in rather than leaving them off and just making the T-slot, because we had a lot of trouble with flutter and piston clatter, and I thought by cutting a slot in there and expanding it, we could probably take care of that flutter that was in the cars at that time, when the cylinder was worn.

Pistons cost money in those days. We had pistons in stock, but we had no means of reboring, as I mentioned, and lapping was an expensive thing. When the piston was replaced, we had to lap them out. If we were just looking for piston flutter, we took the bottom and the head off. To adjust for this wear, we planned not to take the whole engine down; we worked from underneath; you could leave the pistons right in the cylinders.

I never gave up that idea of making an adjustable piston and slit, even though the corner broke off.

I tried out another device about a year later, as my next development, where I used a perpendicular slot 4, and used two taper screws in it, and we installed this in that same job. We had a longitudinal and diagonal slot and almost a vertical slot, with a hole drilled right in the horizontal slot, tapered, with a boss on the inside; it is not shown here. By "horizontal slot" I mean the vertical slot 4.

That method of slotting differed from the one that we put in the Ford, in that it strengthened this corner here, brought this full skirt around. That piston had a horizontal slot around like 3 in my patent, and it had a vertical slot going down from almost the center, as near center as we could judge it. We attempted to spread the piston apart there by welding a boss on the inside of that vertical slot, one below and one above, and drilled a hole and reamed it out and put a lockwasher—no, a nut,

two nuts, on. One was a nut that drew it up, and the other was the jamb nut.

I do not know where any of those original pistons, like my patent, are, which we put in the Sullivan car. I have looked for them. Neither do I know where the piston is we replaced, the one in which the corner had been broken off. I also looked for that.

The next step of adjustable piston in which there was an almost vertical slot corresponding to 4, and tapered screws, that piston was put in that same job about a year or so later, and then a little later on in Jensen & Trier's car. I don't know what became of those particular pistons, however I have looked for them.

The pistons with the vertical slots were put in the Sullivan car about a year or so later; that was a set of four. It seems to me that model piston was cast instead of welded.

I had some pistons made like that installed in the Sullivan car, and I have just lately succeeded in locating one of them in my nephew's basement in Chicago. I gave it to him about fourteen or fifteen years ago, I couldn't give the exact time. I recognized the piston as one that I had made. I can produce that piston. (Witness does so.)

Mr. Bruninga: The piston is marked for identification "Defendants' Exhibit 5-K10."

(Narrative continued) That is the piston that I found in my nephew's basement. It was made some time in the fall of '16 or early part of '17. That was included in one of the sets; made in three sets.

Describing this piston, I made minor changes. I suppose I had better break this ring off. (Witness takes off ring.) I cut a diagonal slot under this lower ring so as to let any filings out of there or anything of that sort, and then I cut a slot, diagonal slot, through here, and drilled a taper hole to one side; I had to shove that to one side in order to put the rod in. In other words, that has a partially inclined horizontal slot, which is set a little to one side, in the lowest ring groove. These little pins are taper screw pins. The hole in the piston wall was tapered also. The piston then expands, opens up, expands the piston and opens up the skirt. You can do that by hand.

We had to place that slot a little to one side to clear the connecting rod.

I think these particular pistons were made in St. Paul, by the Burke Machine Company. I don't know whether they were in business then, or not, but my brother-in-law got acquainted with him when he was down there, and he said he could make up a few sets for me. I actually don't know where I got those pistons except what my brother-in-law told me.

That particular piston has a hole in it—that was very thin apparently, and when we rammed it down with a hammer handle, which we usually use, it caved the top in, and we had to replace it with another one. I remember putting that hole in that piston.

By placing the slot in the lower ring land, we didn't have to press down this top ring around it. We made that for another purpose, too. We thought also by covering up the slot it wouldn't leak down through, if I remember right.

I thought that it was an advantage to put the horizontal slot in the ring groove.

The leg and expanding construction was the same in Exhibit 5-K10 as it was in the pistons put into Sullivan's car. They also had a taper screw connection.

The letter dated April 2, 1917, addressed to Walter Schoengarth by Louis Bagger & Co., and marked for identification Defendants' Exhibit 5-K11, came from Washington, D. C., and is one that I must have brought along with me. That letter is addressed to me on Frederick Street, Ironwood, Michigan. I received that letter, and it has reference to this later type piston that I made, Exhibit 5-K10. It says here, "Notwithstanding this fact we advocate additional patent in a case like this because you really have a new and probably patentible feature in the way of these bolts and nuts, which by being locked in the slots and so forth, one may tighten and may spread or expand the piston." That letter refers to mine of the 26th of March, 1917; and it further states: "An express package containing model of one improved piston just received." I know I sent Louis Bagger & Company a letter, and also two models, the one of my original piston as shown in my patent 1,174,092, and later on another model. I am not sure what kind of model was sent to them in the second instance, but I think it was somewhere on the order of Exhibit 5-K10. It didn't differ any, only that it must have been the original cast iron model made up and sent to them. That piston model had a vertical slot like in the patent.

I do not know where my letter of March 26, 1917 is. I don't know whether that particular letter that is referred to was sent to me by Louis Bagger & Company with the rest of the correspondence. Just what we have here is all that he sent to me.

Referring now to the piston like Exhibit 5-K10 with the straight slot and the adjustment, if I remember right, I think there was possibly three or four sets of four made up. They were made up before I sent Louis Bagger & Company that letter to which this is a reply. I think it was in the spring of the same year.

With the exception of the broken piston Exhibit 5-K10, we replaced that set that was previously in Sullivan & Cumbe's job and then later on we put a set in Jussen & Trier's, then we put a single on No. 1 cylinder on a Ford. These I don't recall, because I lost some of the trade. That was later on, probably 1918 or '19.

I got paid for those jobs.

The piston in Sullivan & Cumbe's car ran fairly well. It ran up to 1925, but we neglected it for three or four years; I never paid any more attention to it until it got into a wreck; that is as far as I located the car, in 1925, I think. The car required adjustments in that period, but we never touched it. It worked fair, but our adjustments hammered out and we changed it later on.

These pistons were installed in that Sullivan & Cumbe car before I wrote Louis Bagger & Company that second letter in 1917.

My financial condition during 1917 wasn't very good. At that time I was making $2.50 a day. I didn't have any sickness at that time; but the sickness that really was serious was, I think, in 1914; my wife was sent to Rochester and I had a big doctor bill to pay there. It wasn't cleared up until about 1921. That was the Mayo Brothers in Rochester. I am not sure what the precise bill was, but I know it was over $300, approximately $350 or $450.

I had a hard time scraping up the $35.00 I sent in with my application in July; I didn't have an easy time scraping up any of it.

I do not know what delayed the filing of my application from July 29, 1915, to October 1, 1915. I expected it to be filed as soon as the attorneys got my money.

I do not know what this case is about.

My expenses are being paid here. You wired me $50.00 to cover all my expenses.

I have no interest in the outcome of this case.

Mr. Bruninga: Take the witness.

Cross Examination by Mr. Richey.

The function of those No. 7 lock washers, as shown in Exhibit 5-K2, I suppose, was to lock the adjusting nuts into position and the apparatus in its adjustable position, so it couldn't move.

That piston, Exhibit 5-K10, is more rigid than the piston shown in my patent, and the function of the screws or bolts was to adjust the piston, then lock it rigidly in position.

Mr. Bruninga: I want to offer in evidence Exhibits 5-K10 and 5-K11.

The Master: They will be received with the same reservation.

(Narrative continued) This wooden model I sent to Washington, I think, was about—I don't know whether smaller or larger, but it was a wooden model; I very distinctly remember that. I wouldn't say whether or not it was as big as a piston. I made so many different models, I made models in later years also, way back in 1917 and a later model I had been working on, I mean in 1927. The wooden model was as near as possible as I could make it to this drawing, Exhibit 5-K2. These parts here, I think, I am quite sure, was made out of actual metal, and it was screwed into the wood. I may have tapped it out; I am not sure. The model was partly metal and partly wood. That changed drawing is practically the same identical thing as the original; there is no difference; Louis Bagger didn't understand it, is all. There is no difference, only I just make the thread marks in there, and he thought I abutted this up against there, if I remember right, in the correspondence, and then I had to explain it thoroughly, and made a little zig-zag, identified that as a thread; that is the only thing.

The pistons that I made and put in that car were like this little drawing, because he didn't actually understand it. I had to send that in there.

Q. You told Mr. Watts last February that you didn't remember what part of 1915 it was that you made up that set of pistons that you said you put in Sullivan's car, didn't you? A. Well, we argued it out there that day; tried to get it as near right as possible, and we have argued it out later. Charlie Garland and Mr. Stenstrom and—

Q. Please answer my question. I asked if you didn't tell Mr. Watts at that time that you didn't remember

what part of 1915 it was that you put those pistons in the Sullivan car. A. Well, I don't remember for sure just exactly what I did tell Mr. Watts.

Q. You don't remember, although that was only a month ago or a little over a month ago, you don't remember it? A. Sure I remember that.

Q. That is, you weren't sure a month ago what part of 1915 it was that you installed these pistons in the Sullivan car? A. Well, that I couldn't say exactly. I know it was before that time.

Q. As a matter of fact didn't you tell Mr. Watts on February 16, 1933 that you didn't remember at that time what time in 1915 it was that you put those pistons in that Sullivan car? A. I suppose I did, if that is the day.

(Narrative continued) Since then I have talked to Mr. Brunings about this matter.

I also told Mr. Watts at that time that this second set of pistons wasn't installed until about 1917. I wasn't sure then what time in 1917 it was. I told Mr. Watts that I was certain this second set was not installed until after I moved out to my new house. We moved out to that new house some time in the middle of 1917.

I placed this first set of pistons, like shown in my patent, in the Sullivan & Combe car, and then that car drove out of Walter Barr's garage. I saw it occasionally after that. We probably inspected the pistons once and maybe twice; I am not certain about that. I can't remember that. We were keeping them under observation all the time, with the idea of finding out how they would work. We kept that up until the time we took that set of pistons out and put in the second set; and I looked at it at the time I made that other minor change where I cut that piston without an adjusting pin.

We took out the first set of pistons and put in the second set because that corner broke off and we had trouble with it more or less, and I naturally knew that the other arrangement that I had made, I thought it would work better. That is, I found that the first set wasn't working satisfactorily, so I put in the second set, which was an improvement on it. This didn't apply to all of the pistons, not of the adjustable type; three was in that car of the adjustable type and I had removed one and put in a plain one with just a diagonal and vertical slot, and then when we made this change, to continue with our adjusting devices, we installed this Exhibit 5-K10 piston.

We took all of them out of the car, including the one that didn't have any adjusting means in it, and substituted the pistons that had the adjusting means, because we thought that this 5-K10 was better than the others. It was better to a certain extent.

I also told Mr. Watts on February 16, 1933 that I wasn't even able to get the date when I took out the piston of the first set that broke; and I told him I was very much discouraged at the result of this piston breaking. I told him the truth about it.

That piston was 1½ thousandths oversize of the standard cylinder bore. At the time my patent was granted we didn't know very much about how cylinders spread; we probably lapped them in; we had no thickness gauge or anything of that sort. We put our pistons in, and when they were free we called them good. Some of them set on us because we didn't know; we had no instruments, no means of adjusting those things. Mr. Barr was very slack in getting good tools.

That same answer applies to the rest of the pistons on the question of clearance. We were careful enough about clearance to know when it wouldn't fit.

As to pistons like 5-K10, we would run that up until it would touch the cylinder wall and just probably use good judgment; that is all we ever used.

The first pistons we put in like those shown in the patent, we took old pistons and modified them and put them back in.

I arrived in Cleveland on this trip on Sunday morning, and I have been here ever since. I have been stopping at the Cleveland Hotel with Mr. Brunings. I have seen Mr. Brunings and Mr. Dorris. I have been with them right along, and have had meals with them.

I was making more money in 1917 than I was in 1915. I was getting $3.60 a day, and my wages were changed in 1917, the latter part, when I went to work for Gale, I got more money.

I had some of my debt to the Mayo Brothers paid off in 1917, but I didn't pay it very fast. My financial condition was slightly better in 1917 than it was in 1915.

The garage I worked in handled and repaired the Ford car in 1915. I suppose there were parts of old cars around there, but we had a stock of new pistons, rings, pins, rods, and so forth. We had old pistons around there as well as new ones, and presumably some that had been junked or on the verge of being junked.

I told Mr. Watts that it was a difficult job to make that wooden model, and it was a difficult job; there was quite a little labor to it. It didn't take me very long, of course, I presume, to make it, not any longer than it would now. I ran the lathe by foot power. It belonged to my dad.

The seasons vary in Ironwood as they do in Cleveland. We have four seasons, but our winters are very long. The last part of September we have a flurry of snow, but winter doesn't really set in until the last part of October or the first part of November. We never have any leaves on the trees in the latter part of October.

Q. If I say I was up there one year in October at the Ironwood mine and the weather was still clear and those yellow leaves were still on the poplar trees, you would say that wasn't so? A. Well, there might be such a thing, but conditions change; there may be some times we have early and some times we have a late fall, that is true.

(Narrative continued) When Mr. Bruninga handed me this letter 5-K11, I hesitated quite a little while before I recognized it.

Mr. Richey: That is all.

Re-Direct Examination by Mr. Bruninga.

I think I read that letter, 5-K11, last Sunday. I am not sure; I wouldn't say, Mr. Bruninga. I have really forgotten right now where I got that letter. I do know that I received such a letter; I was living at 202 Frederick Street at that time. Those other papers were received from Louis Bagger & Company a few days ago.

I recognize the envelope you have just handed me as one addressed to Mr. Walter Schoengarth, Hotel Cleveland, Cleveland, Ohio, and is marked "Hotel Cleveland" on the back and "March 21, 1933." Practically all this correspondence here was in that envelope, the correspondence being marked K-1, K-2, K-3, K-4, K-5, K-6, K-7, and K-8. I don't know whether or not 5-K11 was in that envelope; I don't think so; I am not sure.

I had not seen the papers K-1 to K-8, inclusive, that were in that envelope, recently before I saw Mr. Watts. I have not seen them in the last few years. I do not know whether or not I saw 5-K11 before the time I saw Mr. Watts.

Mr. Watts did not tell me who he represented. I did say that I discussed the whole thing freely with him. At the time that I talked with him I didn't have these specific dates given in these letters and various other exhibits K-1 to K-8, before me. I tried to guess at the month of 1915 as near as I could. These letters helped me considerably.

I remember that all of the trees, that the leaves should be fallen off the trees before October, because I know we went duck hunting, and it is very noticeable the leaves fall in October. I imagine I went duck hunting in 1915; I always went duck hunting; I can't be certain.

I had not paid off Mayos in 1917. I imagine I was getting $250 a day in 1917, if I remember right. My wife and my brother-in-law were dependent upon me at that time.

What I would call a standard piston in the Ford in 1915, if I remember right, was 3¾", that is the standard size, and it is bored out to the 3¾". I never milled it up, but we took that into consideration and if they wanted, when you had to put in oversize, those pistons we received ran all the way from 1½, 2½, 3, 5, and I think 10; I wouldn't say, 31; but we never used those larger ones at that time. I know they came in that size.

When I spoke of a standard piston, that meant a piston that fit freely, that had a clearance. A 1½ thousandth over-size piston was 1½ thousandths bigger in diameter than the standard piston; I wouldn't say for sure just exactly 1½; it may have been two thousandths, but I don't remember that exactly.

When we fit those original pistons in Sullivan & Cumbe's car, we adjusted the size so it fit in the bottom of the cylinder walls, and if it didn't drag too heavy, why, we called it good. We didn't use any micrometers.

When I told Mr. Watts that I didn't make that second piston like Exhibit 5-K10 until after I moved into my new house in the middle of 1917, I said that I had not looked at the letter of April 2, 1917, which letter was addressed to my house. That second model piston that I worked on is referred to in that letter. I was wrong when I told Mr. Watts that that particular piston had not been made until I moved away from 202 Frederick Street.

When I saw you after I had seen Mr. Watts, you told me to tell the truth as near as I could remember and the facts that I could get. You did not tell me what to testify. You did not tell me to be sure to fix the thing so you would win this case.

You particularly impressed upon me to tell the truth, and that was your method of doing business. You didn't try to change any of my dates that I had.

Mr. Brueninge: I offer in evidence envelope addressed to Walter N. Schoengarth previously referred to as Defendants' Exhibit 5-K12.

(Re-direct closed.)

Re-Cross Examination by Mr. Bishoy.

These papers came to me from Washington since I have been in Cleveland.

I made my wooden model before I sent in my patent. I told Mr. Watts that during that time I made the drawing. My drawing was sent in before I sent that in on that date, I am sure. I don't know what I told Mr. Watts about the wooden model. I don't remember just whether that drawing followed the wooden model or the wooden model followed the drawing; it must have been at the time, as near as I remember.

I don't correctly remember telling Mr. Watts that I made the set of pistons for the Sullivan & Combs car after I made the drawings.

I didn't say anything in any of these letters to my attorneys about installing any of these pistons in the Sullivan & Combs car prior to this Exhibit 5-K11.

Mr. Bishoy: That is all.

Re-Direct Examination by Mr. Brueninge.

I wanted my attorneys to take out a patent application, not look me financially.

Mr. Brueninge: That is all.

(Thereupon adjournment was taken to 9:30 a. m. of the following day.)

(Thereupon at 9:30 a. m., Thursday, March 23, 1905, the hearing was resumed.)

Mr. Brueninge: I want to make a statement, your Honor. There is another witness, Mr. Charles Garland, who was mentioned by Walter Schoengarth yesterday, who lives in Ironwood, Michigan. I intended to bring him here and I got in touch with him Sunday evening before Mr. Bishoy stated his position as to the Gulick Exhibits 48 and 51, and I found out that he had been operated on for piles.

He seemed to be in fair condition at that time. Then I wanted him to come here and he wired back that he couldn't; he thought he could come about Saturday, I mean that he could leave Friday night. His doctor told him he could leave Friday. Then I 'phoned him, both Mr. Gibsongarth and myself talked with him over the 'phone on Monday, last Monday, and I thought that he might be able to be here on Saturday morning, and then I found out, as Mr. Gibsongarth said, he had a relapse and in bed and in great pain, as they usually are in cases of that kind. I don't know when he can be here; at any rate he cannot be here this week. Now, this is not a case of sickness where we don't know how long a man is going to be ill; we know there is a definite recovery in the matter of days, not weeks. I am sure I can get him here the latter part of next week for such time as may be convenient to counsel. I may arrange it practically at the convenience of opposing counsel to bring Mr. Gerland here, rather than go up to Brentwood and take his deposition. Your Honor will see that his evidence will be very material in the support of Mr. Gibsongarth.

The Master: How long do you expect to use him?

Mr. Brundage: Oh, just a couple of hours, that is all. It will be just one day's session, that will be all there will be to it, except I understood plaintiffs' counsel wants to recall Mr. Jeffries for a short period, which I think they are entitled to have.

Mr. Bixby: I said I may want to recall him.

Mr. Brundage: That will be entirely agreeable to me, if they want to recall Mr. Jeffries.

The Master: Well, when we get done with these witnesses we will see.

Mr. Brundage: Your Honor, I want at this time to make a motion, and I will make it in writing if necessary, of leave to amend the answer in each of the three cases, amend paragraph 36 of each of the answers and set up the Gibsongarth patent 1,174,093, of March 7, 1916, and to set up Mr. Gibsongarth, under paragraphs 36, 36, and 37 of each of the bills of complaint, only as against the Gullik patent, and only as against those claims which are relied upon as having a foundation in Exhibits 48 and 51, and which counsel gave me notice of last Monday. I can

support that by an affidavit if necessary. I think the record is clear on that point.

The Master: Well, of course the practice in the state court, ordinarily, is that the pleadings may be amended to correspond with the proof. I assume that a similar rule prevails in the United States court.

Mr. Richey: I think the rule is that if the excuse can be shown for the delay, but the rules in federal court are designed to prevent surprise.

The Master: I understand that.

Mr. Richey: Now, where a man has known about the Schoengarth patent for ten years before this suit, or five years, and hasn't set it up in his answer, the question arises whether he has the right to rely on that as newly discovered evidence. Well, we don't oppose it anyway.

The Master: Then it may be received, and you may file your amendments, in regular form so that they will be a part of the pleadings.

Mr. Brumings: I will do that. I can do that in each one of the suits.

Thereupon the plaintiffs recalled as a witness in rebuttal ZAY JEFFRIES who, having been previously sworn, further testified as follows:

DIRECT EXAMINATION by Mr. Richey.

Q. Doctor, you testified in this case before? A. Yes.

Q. You were present during the time Mr. Gulick was testifying? A. Part of the time.

Q. You heard some testimony here regarding the character of tests that are given aluminum pistons from him? A. Yes.

Q. What if any experience have you had directly or indirectly in connection with the testing of aluminum pistons to determine whether or not they should be put into use? A. Since the latter part of 1915 I have had considerable experience with reference to trying to make aluminum pistons stay sold. In that process I have witnessed various kinds of tests, at various places, and examined a great many pistons, after block tests and after road tests. I have also run road tests on pistons.

Q. Now, will you state just what are the character of tests that are employed to develop the characteristics

of a new piston to determine whether or not it shall be used commercially, and give your reasons for the tests as far as you know? A. A great many factors, of course, enter into the adoption of a piston for standard. Among the factors, and a very important one, is the cost of the piston, and I will consider principally the engineering features. The first step is what is known as a trial test of some sort. At the present time and for a good many years that trial test has usually been made on the block. The trial may include a good many changes of conditions during the early stages of the test, such as putting the pistons in with a clearance considered to be too little for proper operation, and then running the motor for a little while to see at what point the pistons seize or rub too hard. Then the pistons may be taken out and given additional clearance and run again. After the proper clearance is found in that way, then a block test for endurance is usually run. If that is satisfactory, then the piston is usually put on the road. The road test is usually a fairly long and a fairly severe one, and among other things, it is best to have the road test carried on throughout an entire cycle of temperature changes, that is, it is desirable to have tests in the winter time and in the summer time as well in order to make certain that all of the varying conditions encountered in service are satisfied. There is no particular standard of acceptance; it depends a good deal on the nature of the change, on the magnitude of the change. If it is a change of a small nature, it may not require so much testing to prove it in. A more radical change might require more testing. Furthermore, the matter is pretty much an arbitrary one because it is settled by human beings: the engineers of the engineering staff, if it is an engineering matter, or perhaps the purchasing department, if it is a matter of economics.

Q. What is a normal mileage on outdoor tests to test out pistons such as these split skirt pistons?

Mr. Bruninga: Now, or in 1911?

Mr. Richey: Well, say as early as you knew anything about it?

A. I don't know as I could name any normal mileage.

Q. Why is it that these pistons have to be tested out thoroughly before they go into use? A. Because they must function satisfactorily under a great variety of conditions, and they must endure. The pistons must not

break; they must be serviceable over a relatively long period of time.

Q. Now, would you look at the Schoengarth patent 1,174,092 and state whether or not you have read that patent over and are familiar with the disclosure? A. Yes, I have seen this patent before and have read it.

Q. Now, will you compare that in structure, mode of operation and results with the disclosures of each of the patents in suit? A. The Schoengarth patent 1,174,092 relates to a piston which is adjustable in diameter. The piston is so slotted, horizontally and spirally, or approximately vertically, as to permit the skirt to be changed in diameter a small amount. The slotting of the skirt is not designed to change the diameter of the piston skirt by flexing when the piston is in operation. In that respect the Schoengarth piston has no relation to the Gulick construction, the Jardine construction, or the Maynard construction, the pistons in all of which are intended to flex while in the motor. The object of the Schoengarth piston is fairly obvious. When a motor is new the piston is properly fitted; when the motor has been run a certain distance, the cylinder barrel wears and the piston skirt wears; in due course the clearance between the piston and the cylinder may be too much for proper operation. Schoengarth aimed to make the piston last longer by providing an adjustable skirt so that when the clearance became more than was desirable, the piston could be removed from the cylinder or as he states, even adjusted while in place by means of locking rings and nuts so placed in the inside of the piston skirt that the adjustments could be made. After the adjustments were made, the piston became a rigid type piston, the same as when it went into the motor in the first place, or the same as any other conventional non-slotted piston.

There is another feature of the patent which need not be considered, namely, the adjustable bearing in the pin boss. The Schoengarth piston would in fact be more rigid than the ordinary piston because of the size and location of the locking rings. It would also be heavier and it would be what is known as a composite piston, that is, one composed of more than one part. The piston design itself is not important in the Schoengarth disclosure; so it has no relation to the Schmiedeknecht patent. The nature of the locking rings and the absence of relief would, among other things, make the piston have no relation to the Moore patent in suit. Even if the locking

rings were omitted,—and no suggestion that they can be omitted or should be omitted is contained in the patent, at least I saw none,—the Schoengarth piston would still not be similar to any of the patents in suit. No relief from the slot to the bottom ring groove, no relief from the horizontal slot in the bottom ring groove in the Schoengarth piston is described or suggested, and there is no relief described around the bore section. In my opinion therefore, the Schoengarth patent has no relation whatsoever to any of the patents in suit.

(Adjournment thereupon taken to 1:30 p.m. of the same day.)

(1:30 p.m., Friday, March 17, 1933, the hearing was resumed.)

Q. Now, Doctor, you have discussed the Schoengarth piston without adjusting means in it, and structure. Will you also take up the question of operation and results as compared with the patents in suit? A. The Schoengarth piston, without the locking rings, would not operate like the pistons of the patent in suit nor would it produce the same results.

Q. And would you give your reasons for your answer? A. The place on the piston where flexibility would be most needed to help against wall pressures, would be the section just below the lowest ring. This section on the Schoengarth piston would have the full skirt diameter and would not be flexible, nor could the diameter be decreased by distortion in any direction without increasing the diameter in some other direction. The piston would have flexibility at the bottom of the skirt, where it would not be needed, and no flexibility at the top of the skirt, where it is most needed, and absolutely necessary if the clearance is not made sufficient to operate without need of skirt flexibility.

Q. Now, you were here and heard Mr. Gulick testify about the pistons that he had tested out and heard him describe those pistons and what the tests were and how they operated during the tests, were you not? A. Yes, I heard most of that testimony with reference to operation and the construction of the pistons.

Q. The one of them in 1911 and one in 1914, you heard about those two, didn't you? A. Yes.

Q. Now, would you compare those pistons in structure, mode of operation and results, with the piston as it is shown in the Schoengarth patent 1,174,092? A. The

Gulick 1911 piston, according to his description, would have one horizontal slot and one vertical slot. The horizontal slot, as I understood it, would mark the top of the skirt. That is, the head relief extended from the head proper down to the horizontal slot. This would divide the piston into two parts; one of which would be non-flexible, but with relief, and the other part flexible, with no relief. The skirt flexibility would be gained as a result of the vertical slot which in the Gulick piston Exhibit 48 extends from the horizontal slot, near one end of such horizontal slot, spirally around the piston skirt, ending, say, about 1¼" from the vertical line drawn from one boss to the bottom of the skirt. The Gulick piston would have a flexible skirt, more flexible at the bottom than at the top of the skirt, but nevertheless the skirt would have flexibility throughout its bearing length. In the Schoengarth piston there is no flexibility of the skirt when the piston is operating in the motor. So that the Schoengarth piston is a rigid type piston, as it is used, and the Gulick piston has skirt flexibility with head relief properly placed so that the skirt flexibility would have opportunity to function to compensate for extra expansion of the piston. The 1911 piston, apparently, had no relief in the skirt section around the bosses, and to the extent that it had no such relief, it would not permit of as much compensation for extra expansion as it would have had the relief been placed around the bosses; but nevertheless, it was a cast iron piston and the expansion problems were not as severe in cast iron pistons as in aluminum pistons, and therefore the Gulick 1911 would function, to a degree at any rate, as a flexible skirt piston. The Gulick 1914 piston, as shown in Exhibit 51, is a flexible skirt piston with the horizontal slot extending completely around the skirt. With the one vertical slot on one of the thrust faces, between the bosses, the Gulick 1914 piston would operate as a flexible skirt piston. This assumes that the head section is relieved by machining to a smaller diameter than the skirt section, and that the horizontal slot marks the boundary between such relieved section and the skirt section proper, which I understand is the construction in Exhibit 51. This Exhibit 51 piston is considerably more flexible at the top of the skirt where flexibility is most needed than is the Gulick 1911 piston. Not only does the Gulick 1914 piston have more flexibility than the Gulick 1911 piston because of the greater length of the horizontal slot, but the web or rib construc-

tion is such as to make possible some compensation for expansion by distortion of the skirt section as the result of cylinder wall pressure. None of these factors are found in the Schoengarth patent and, consequently, the Schoengarth piston differs from both the Gulick 1911 and the Gulick 1914 pistons in construction, mode of operation and results.

Q. With respect to method of testing pistons, say back in 1914 and '15 when you first became connected with this matter, not only pistons but automobile equipment, will you state whether or not to your knowledge it was customary for engineers and employees of the company to test things in their own or factory cars? A. Yes, it was.

Q. Now, in the testing of such a piston, what is considered in this industry as the termination of the test and the dividing line between the test and the commercial activity with respect to the piston? A. Either when the test is declared to be finished and a conclusion reached one way or the other, or when the device which is being tested is adopted or used as standard.

Q. And what physical act takes place with respect to the running of the device at those dividing lines? That is, perhaps you don't understand me. What I mean is, state whether or not the device is continued to be tested when you come to that dividing line. A. Oh, additional tests might be made; but I should say that if you were making one test on one device and the test is concluded and report is made, it is either satisfactory or it is not satisfactory; if it is satisfactory presumably the part is accepted for standard.

Q. Now, you heard Mr. Gulick testify yesterday as to the tests he made on his 1911, 1914 and 1915 pistons. Will you state whether or not from your experience and observation of tests of pistons of that character, the operations he performed, the miles he ran, exceeded what was necessary to make the proper tests on those pistons?

Mr. Bruninga: I object to it, first, because the witness cannot testify what was the practice in 1911 or even in 1914; he didn't come into this field until December, 1915.

The Master: I understood his services began in this branch of the science after the war was declared.

Mr. Richey: There would be no material change.

Mr. Bruninga: That goes to the weight of the answer.

Mr. Richey: To the weight of the answer, yes.

The Master: With that limitation he may answer.

A. The one thing a piston must not do in service is to break. When a piston breaks, it is quite apt to cause so much damage to the car that an expensive overhaul becomes necessary, or even the motor may be wrecked. So that I should say that these pistons certainly were not run further than was necessary to determine their durability.

Q. And by durability, you mean their ability to go without breaking? A. Yes.

Q. That is, to perform their desired function so as to prove their utility with respect to breaking? A. That is true.

Q. You were here when Mr. Monckmeier testified about these Exhibits 3-V and 3-W, weren't you? A. Yes.

(At this point the testimony of Tibbetts, Record pages 859 to 877, was taken.)

(At 9:30 a.m., Saturday, March 18, 1933, the hearing was resumed.)

ZAY JEFFRIES, being recalled, further testified as follows:

DIRECT EXAMINATION by Mr. Richey.

Q. Now, will you compare each of the Exhibits 3-V and 3-W, the pistons that were produced by Mr. Monckmeier, with each of the patents in suit, in structure, mode of operation, and results? A. Considering the Monckmeier iron piston, Defendants' Exhibit 3-V, I think it would be desirable to find by micrometer measurements certain dimensions on the piston. I have here a micrometer which measures distances between four and five inches readily to the nearest thousandth of an inch. This is the micrometer which is used regularly in the laboratories of the Aluminum Company of America at Harvard Avenue in Cleveland for such measurements. The first measurement which I am making is the diameter of the piston across the boss region just below the boss holes.

This diameter is 4.479". The next diameter is the one across the boss region but just above the boss holes. This diameter is 4.478". The next diameter is across the bottom ring groove, the width of the groove being small enough so that the micrometer surfaces engage at the same time both edges of the groove. The diameter is 4.479". This groove is above the horizontal slots in the piston. The next measurement is across the boss diameter but of the second narrow ring groove. The term "second" in this case indicating the uppermost of the narrow ring grooves, and the other narrow ring groove is the lower of all the ring grooves. This diameter is 4.477". The next measurement is still parallel with the bosses but across the land between the top ring groove and the ring groove with semicircular cross section, which may be called the second large ring groove. This diameter is 4.475". The next measurement is across the top land, parallel with the bosses, the measurement being about 4.467".

Q. These last measurements were made in which direction? A. All the measurements up to this point have been made parallel with the line drawn between the two bosses. I will now make some diameter measurements in a direction approximately at right angles to the previous measurements, namely, across the thrust faces of the skirt portion and in a similar direction across the head. The first measurement in this direction is across the top land or across the head section; this diameter is approximately 4.467". The diameter in the same direction across the first land is 4.469". Across the top narrow ring groove, in the same direction, it is 4.468". Across the bottom narrow ring groove just above the ends of the vertical slot the diameter is 4.472". Just below the horizontal slot and across the ends of the vertical slot, the diameter is 4.471". In a horizontal plane, this diameter would be just above the horizontal section taken across the tops of the boss holes. The next diameter, which is just below the horizontal section but in the line immediately below the boss holes, the diameter across the thrust faces is 4.476". These measurements would indicate that if the piston had been fitted in a cylinder 4½" in diameter, the clearance would have been .030" in the skirt section, and at the bottom narrow ring and also at the top narrow ring. The measurements would also indicate that there was no boss or side relief on the piston at the time of machining. The measurements

would also indicate that the piston had been run in a motor and the wear across the thrust faces has been considerable. The measurements also indicate that the real division between the head section and the guide section in this piston is at the upper narrow ring groove, which is more than ¾" above the horizontal slot. The fact that the guide section of the piston extended at least up to the upper narrow ring groove is indicated not only by the measurements parallel with the bosses where the wear would have been a minimum in the operation of the motor, but it is also indicated by the measurements across the thrust faces which indicate the elliptical nature of the head section up to the upper narrow ring. Had these ring land portions not been bearing against the cylinder wall, they would not have worn to the extent indicated by the measurements. Comparing this piston with the Gulick patent in suit, then, I would say that it does not have the construction of the Gulick patent in suit, it does not have the mode of operation, nor could it give the results of the Gulick patent in suit. The Gulick patent in suit describes the division of a piston into two parts. For example, as stated beginning line 41 on page 1 of the Gulick patent: "Referring to the drawings, 10 represents the head portion of a piston, and 11 is the skirt or guide portion which is shown as separated at its periphery from the head, leaving an annular slit or opening 12 there between." The skirt or guide portion of the Gulick patent is the portion which bears against the cylinder wall. The head is not supposed to bear against the cylinder wall; if it did, it would become part of the guide section. Gulick therefore shows the horizontal slotting separating the head section from the guide section, and the vertical slotting in the guide section only. The Gulick piston can function to compensate for excessive expansion because the head section does not serve as a guide; that is, does not touch the cylinder wall, and the skirt or guide section is made flexible so that it can compensate for extra expansion as the piston heats up.

The Monckmeier cast iron piston could not function in a motor like the Gulick piston. The slotting in the Monckmeier piston is to my mind absolutely useless and could be nothing but impairment of the piston in its functioning, except that the great distortion of the cylinder barrel in its lower portion might permit the bottom of the skirt to adjust itself more readily to the distorted

contour. In so far as clearance is concerned, in the Monckmeier cast iron piston I have made a calculation which is very simple, showing that if the cylinder barrel was 4½" in diameter, as suggested, the clearance would be at least 20 thousandths of an inch in all diameters, and the piston would have to become 700° F. hotter than the cylinder before seizure due to high piston temperature could result. In this piston 3-V, long before the slots could have any opportunity to be any help in this piston, the ring land portion, that is, the lands adjacent the narrow rings, would seize against the cylinder walls. These ring portions would be much hotter than the lower portions of the skirt and hence would expand more than the lower portions, merely because they are hotter, and because originally they were the same diameter as the skirt portions, those portions must rub against the cylinder walls first. Those land portions adjacent the narrow ring groove therefore were the true guides of the upper portions of the Monckmeier cast iron piston.

Considering the piston from the standpoint of the Mocers piston, there is no combination of horizontal slotting and skirt or guide section relief as in Mocers; so the Monckmeier piston can have no bearing on the Mocers patent.

Considering the Schmiedeknecht patent, there is no suggestion that the Monckmeier patent has anything to do with the Schmiedeknecht construction; the two constructions are different.

Considering the Jardine patent in suit, the Monckmeier cast iron piston can have no relation to it, as I see it, because the Jardine patent combines the relief of the head section down to the guide section. On page 1, line 87 of the Jardine patent, is found the following: "The flange 4 of the head portion which has a smaller outer diameter than the guide portion 2, the diameter of the latter being slightly smaller than the internal diameter of the cylinder in which it is to function"—so that the Jardine patent clearly describes the head portion as being of smaller diameter than the guide portion, and the guide portion being separated from the head portion by the horizontal slots. Furthermore, the Jardine construction relates to relief around the boss section which is not provided or found in the Monckmeier piston. Therefore the Monckmeier piston has a different construction, different mode of operation and gives a different result from the Jardine construction.

Considering the Maynard patent in suit, the same things as said of the Jardine patent apply. This matter of the separation of the head section from the guide section is shown in an exaggerated way even in one of the drawings of the Maynard patent in suit, Fig. 3. The horizontal separation is shown at E, and the skirt or guide section at D, and the head section at B. The very substantial difference in diameter of the head section and the skirt or guide section separated by the horizontal slot, is clearly shown there. The Monsknieier piston therefore has a different construction from the Maynard piston; it has a different mode of operation from the Maynard piston, and it gives a different result from the Maynard piston.

Q. Before you pass to the next piston, this 700° difference in temperature, will you state whether or not that would occur in the operation of an internal combustion engine under normal conditions? A. No, it would not.

Q. Would it occur at all? A. Not without burning up something very badly.

Q. Now, you said that you thought that this piston, Exhibit 2-V, had been used. Will you state whether or not you think it has been used with slots in it, and give your reasons for your answer? A. Of course I will say at the outset that I don't know whether it has been used after it has been slotted or not, but the indications are strongly to the effect that the slots have been put in after the piston has been used. These indications are, first, the very small bridge or web of metal at the top of one of the vertical slots. The chances are that if that piston had been used after the slotting, that that web would have broken up. Also the piston shows carbon collection in various places. It shows that there has been an attempt to remove the carbon deposit. It has mostly been removed from the piston, but you still find carbon deposit on the head. You find carbon deposit in the ring grooves, and you find carbon deposit just above the boss on one side, but you find no carbon deposit that can be seen, even with the hand glass, in the slots. Furthermore, the slots look surprisingly alike, merely machined surfaces that have been rusted by standing around. So that I should say that the evidence on the surface of the piston is more in the direction that the piston had never been run after the slots had been put in.

Q. These pistons here that were put in by defendant, Exhibits E, F, and B, for example, you can tell they have

been run, can you not, by the carbon deposit? A. Yes; not the slightest doubt about that.

Q. And compare the condition of the slots in those pistons, particularly with respect to carbon deposit, with that of Exhibit 3-V. A. Well, the carbon deposit in, say, Defendants' Exhibit E, can be seen on the cut surfaces.

Q. Which cut surfaces do you refer to? A. The slotted surfaces, as well as on other parts of the piston.

Q. What have you to say in the use of slotted pistons with respect to whether or not the carbon does deposit in the slots when they are used? A. Well, the carbon is apt to deposit on any surface that gets hot enough, where there is oil. Now, whether it is cleaned off entirely or can be cleaned off entirely by some abrasion method afterwards, that is a matter which I am not so familiar with.

Q. Well, what about where there is a large clearance, as in this Monokmeier piston, would there liable to be more or less carbon deposit than where there is a small clearance? A. There should be more carbon deposit where there is a large clearance.

Q. Now, will you answer with respect to Exhibit 3-W the same question? A. In the first place, the Exhibit 3-W, which is the Monokmeier aluminum piston, is so mutilated that it is difficult to gain such a complete story as the iron piston reveals. It is possible, however, to take diameter measurements across the boss region, the first one of which I will make is just below the ends of the boss holes. The diameter is about 4.473". There is then a band, which is machined around the entire circumference of the piston of smaller clearance than the remaining portions of the skirt. The diameter in this portion is 4.422". Just above this band there is another portion of the skirt of larger diameter which is 4.473". Then the diameter of the land between the two ring grooves is about 4.470". The diameter of the land adjacent the head is 4.464". The diameter of the head at right angles to the line between the bosses is about 4.461". The skirt is completely broken away on one of the thrust faces, so no measurements can be made there. Judging from the measurements, however, it seems clear that the original clearance of the skirt section just below the bottom ring groove, and the remainder of the skirt section with the exception of the relieved portion previously mentioned, were originally machined to the same diameter. There is only enough metal in the piston to make a measurement across the thrust faces, at the skirt portion

adjacent the lower ring groove. This diameter is 4.464". It seems fairly clear, therefore, that the Monckmeier aluminum piston has a division line between the head section and the guide section at at least not lower than the bottom ring groove. The horizontal slot therefore in the aluminum piston would be placed in the guide section proper rather than at the division between the guide section and the head section, some ¾" below the top of the guide section proper. This is indicated by the measurements across the boss region, where the diameters would be expected to remain more nearly the same as the original diameters, and also by the one diameter measurement across the top of the skirt at the thrust faces, indicating, if anything, that the piston has been worn at the top of the skirt on the thrust faces. If it has been worn by use, it is proof that the head section does not run down to the horizontal slot. Considering this Defendant's Exhibit 3-W, or the Monckmeier aluminum piston, therefore, with reference to the patents in suit, it does not have the same construction as Gulick, nor the same mode of operation, nor can it give the same results, for the reasons given in connection with my discussion of the Monckmeier iron piston Exhibit 3-V. This Monckmeier aluminum piston can have no relation to the Meoers piston, because the horizontal slotting is not combined with the relief around the division between the head section and the guide section. There is no horizontal slotting in the Monckmeier aluminum piston at the division between the head and the guide section, as is called for in Meoers. The Monckmeier aluminum piston does not have the same construction, nor the same mode of operation, nor can it give the same results as Jardine, for the same reasons given in connection with my discussion of Exhibit 3-V. The Monckmeier aluminum piston does not have the same construction, nor does it have the same mode of operation, nor can it give the same results as the Maynard construction, for the reasons given in my discussion of the Monckmeier piston 3-V.

Q. You have heard Mr. Monckmeier testify as to the clearances that were used with this aluminum piston, did you not? A. Yes.

Q. Have you made any calculations to determine how hot the aluminum pistons would have to be with those clearances before there was any operation due to the slotting? A. I started to make a calculation on the basis of the diameter of this piston, 3-W, but if the piston was used there was probability of a cylinder re-grind

before it was put in, which would make any calculation impossible. However, considering merely the dimensions of this piston on the basis of a 4½" diameter cylinder bore, it would have to become some 450° F. hotter than the cylinder before rubbing would take place or before seizure could occur. But this piston has more clearance than was given even the 5" aluminum piston in the Liberty motor, so that it seems to me likely there would be no chance of this piston seizing in a motor even if it had never been slotted, even if the slots had been put in properly so that they could function; but this piston Exhibit 3-W would seize at the top of the skirt just as quickly or a little more quickly with the slots in, as with the slots out. I say a little more quickly because the top of the skirt would become a lot hotter with the slots in than with the slots out, and therefore the slotting of this piston could not have had anything to do with prevention of seizing.

Q. The question came up yesterday about, with respect to the matter of slapping of pistons in the Liberty motor. Are you familiar with the use of the aluminum pistons in the Liberty motor? A. Yes.

Q. Will you state whether or not they were slotted, if you know, and if not, why not? A. They were not slotted. They were not slotted, because the object is to get as much power as possible from the aircraft motor, and the power is not helped by this slotting. The power is impaired somewhat by the slotting. Furthermore, these pistons in aircraft motors are subjected to tremendous mechanical forces in order to develop the large horsepowers that they do. So that mechanical strength is more important in an aircraft motor than it is in a pleasure car motor. I don't mean that it is not important to have strength in motor car pistons; but I mean that the aircraft motor pistons are subjected to higher stresses than the pleasure car motor pistons. So that the aircraft motor pistons are not even slotted today.

Q. Well, is the matter of piston slap of any importance in aircraft? A. No, it is not.

Q. For that reason, what clearance is used in airplane motors? A. Generous clearance is used, enough to make certain that there will be no seizure or hard rubbing of the piston against the cylinder wall.

(Recess taken.)

Q. I call your attention to Defendants' Exhibit 4-G, the article by Mr. Gunn on "Aluminum Piston Design." Did you know Mr. Gunn? A. Yes.

Q. Who was he? A. He was chief automotive engineer for the Premier Company in Indianapolis when I first became acquainted with him. He later became associated with the Aluminum Castings Company or its successor company, and still later went to Packard Motor Car Company.

Q. Do you know in any way how familiar he was with the aluminum piston problem back in 1920? A. Yes, he was very familiar with the problem. He did work on the problem for the Aluminum Castings Company or its successors.

Q. And about when was that? A. I think somewhere about the close of the world war and for some time thereafter.

Q. Now, will you look at his article and the pistons shown therein and state what the purposes of the various designs are and what the history of them is so far as you know? A. This article deals particularly with aluminum piston design; its also treats more particularly of the aluminum piston design for passenger car engines, as indicated by the headline on the first page of the article, page 362. The pistons are designed, according to Gunn, with two principles in mind: first, it is designed with the object of conducting heat away from the head into the skirt and thence into the cylinder walls; and second, it is designed with the object of partly insulating the skirt from the heat of the piston head. He outlines the problem and considers some heavy duty engine pistons first. Those are described in drawings, Figs. 1, 2, and 3. These pistons have fairly heavy webs or ribs to conduct the heat away, especially Fig. 1. Fig. 2 has an excessively heavy head and ring land section to conduct the heat away. Fig. 3 is apparently a piston designed to have some kind of cooling medium put into holes extending from the bottom of the skirt up to near the head. Whether the medium would be mercury or sodium or what, I believe is not stated, but the idea is that something can be put in these holes to collect the heat from the head of the piston and carry it down to the skirt. Then he describes some other types of pistons. Figs. 4 and 5 are two other types. Fig. 5 was known, I think, as the hour-glass type of piston. I don't see anything distinguishable over ordinary pistons in Fig. 4. Fig. 6 is the Ricardo type piston, which has already been referred to in this case. Fig. 7 is the Aluminum Castings Company double-walled skirt piston, which I referred to in the examination in *prima facie*.

Fig. 8 is apparently a piston of the Long type, with the six vertical slots and internal webs, being a double walled skirt structure. Fig. 9 is the Franquist type of piston. Fig. 10 is a composite piston; and Fig. 11 is a piston with heat-insulating material put into the head section, that is, the head section is made hollow, and some material like infusorial earth is supposed to be put in the head section and then a solid covering put over that, so that the heat cannot be conducted readily from the head into the remaining parts of the piston. I think this article describes the problems pretty well and represents the efforts made to solve the problem, without, however, getting very far in the direction of giving the public any real solution of the aluminum piston problem for pleasure car purposes.

Q. You spoke of the piston shown in Fig. 8 as being of the Long type. Is that the same as or different from the pistons Exhibits F and E? A. Seems to be about the same with the exception of the rib in the head, and the drawing in the Gunn article shows no boss relief.

Q. What about the relation between the webs and the bosses? A. Oh, yes, one of the bosses in the Gunn article is attached only to the skirt portion and not to the web portion, which is not the construction of the Exhibits E and F.

Q. Do you know why that change was made in Fig. 8 over the Long piston? A. I suspect it may be drawn in there as a means to compensate for expansion across the bosses.

Q. Now, did any of these pistons illustrated in this Gunn article come into successful commercial use? A. I think it might be said that some of the trunk type pistons were successfully used commercially prior to the introduction of the flexible skirt pistons.

Q. Which ones, for example, illustrated in this article? A. Well, not any specifically as illustrated, but Fig. 1 was not far different from the ordinary trunk type piston used.

Q. That is, used in trucks mostly? A. Yes; but it had been used in pleasure cars, too, to an extent, prior to the introduction of the flexible skirt piston.

Q. That didn't cure the slapping? A. No, the slapping was endured; it wasn't cured. So far as I know, none of the other pistons were brought into commercial use, successful commercial use.

Q. Would you state whether or not this article fairly represents the efforts to solve the piston problem at that

time that went so far as to become tested out seriously and then failed? A. I think it does, yes; it gives a fairly good representation of it.

Q. Now, will you next take up the Van Bever patent 1,031,212 and compare the piston illustrated and described in that patent with each of the patents in suit as to structure, mode of operation and results? A. This patent is another one of the lock ring constructions, somewhat like the Schoengarth patent, only the adjustment here is only at the bottom of the skirt. The object is stated, beginning line 15 in the patent as providing a means to enlarge the skirt of the piston after it has worn down to a certain extent and after it has become loose. The skirt is given four vertical slots, each slot being approximately at 90° from adjacent slots, and the ring 17 is screwed into the inside of the bottom of the skirt with a tapered thread. By these means the skirt can be expanded to a larger diameter at the bottom. That appears to be the object of Van Bever in this patent. He does not have a flexible skirt piston, even at the bottom of the skirt; that is, the skirt does not flex during operation. It seems to me, therefore, that the piston being different in construction and mode of operation and results from those of any of the patents in suit, that it has no bearing whatsoever on any of the patents in suit.

Q. Now, will you answer the same question with respect to this piston, Exhibit B? A. Exhibit B has four approximately vertical slots extending to a point in the skirt section a little above the top of the boss holes. This produces flexibility in the bottom of the skirt section, but none at the top of the skirt portion where it is really needed. This Exhibit B piston therefore is not a flexible skirt piston from the standpoint of the constructions of the patents in suit. It merely provides some flexibility at the bottom of the skirt where it is not needed, and the skirt at the top where it should be flexible in aluminum pistons for pleasure cars, is rigid, has no flexibility, and the skirt has no horizontal separation from the head section. So Exhibit B does not have the construction of any of the patents in suit, does not have the mode of operation of any of the patents in suit, and it does not give the results of any of the patents in suit.

Q. Will you next take up the patent to Vincent 1,279,134 and compare that with the patents in suit in the same way? A. The Vincent patent relates, for the greater part, to what is known as composite pistons,

that is, pistons composed of more than one part. There are several types shown in the drawings, only one of which, with the exception of a ring, can be regarded as a one-piece or integral piston. That is shown in Fig. 7. The construction shown in Fig. 7 is supposed to operate in such a manner that an internally expanding ring forces the bottom of the skirt toward the cylinder wall. There are four slots in the piston, very much as shown in Van Bever. The difference between this and Van Bever is that the ring in the Vincent patent is not a lock ring but an expanding ring. This piston would function somewhat like Exhibit B except that the resiliency of the walls of the piston skirt would be either augmented or impaired by the spring ring in the bottom of the skirt. Inasmuch as this piston has no horizontal separation between the head portion and the guide portion, and inasmuch as there is no flexibility at the top of the skirt where it is really needed, the piston does not have the same construction as those of the patent, or any of the patents in suit, nor does it have the same mode of operation, nor does it give the results. I think the construction of these flexible composite designs places the other Vincent description so far outside the subject matter of the patents in suit that they perhaps need no further consideration.

Mr. Richey: My learned adversary, what is the effective date you claim for this British patent to Hives?

Mr. Bruninga: The application for the British patent was accepted April 8, 1920; six weeks after accepting, such a British patent is open for public inspection. We claim that is the date of publication, six weeks after April 8, 1920.

Mr. Richey: Six weeks would be what date,—do you claim the effective date? Well, we have a certified copy here showing the date as the 24th of June, 1920.

Mr. Bruninga: That is the sealing date. I will grant that is the sealing date. I grant that the sealing date is June 24, 1920; but I rely upon the publication date, which is six weeks after acceptance, which would make it May 20, 1920.

Mr. Richey: Well, if it becomes important, we will have to put you to proof on that date, because we understand the sealing date is the effective date.

Mr. Bruninga: You will agree it was received in the Patent Office on June 1, 1920?

Mr. Richey: We agree that our adversary produces a copy of the Hives patent, photostatic copy showing the stamp of the Library of the United States Patent Office as of June 1, 1920.

Mr. Bruninga: I claim the date of May 20, 1920, as the publication.

The Master: You don't object to it?

Mr. Bruninga: No, and I want to get the date. I understand you don't object because there are photostatic copies produced?

Mr. Richey: No, sir. No, we have a stipulation on that.

Q. Doctor, will you next take up the British patent to Rainforth 6,826 of 1912, and compare the piston illustrated and described therein in structure, mode of operation and results, with each of the pistons of the patent in suit? A. The Rainforth piston is something like Exhibit B except as shown it has more of the slots running from the bottom of the piston skirt or from nearly the bottom of the piston skirt up to approximately the level of the bottom of the boss holes. This Rainforth piston is even more impractical than the Exhibit B because the skirt is supposed to be "sprung" into the cylinder barrel. The top of the guide section must necessarily come well above the bosses, so this piston has no horizontal separation between the guide section and the head section, and hence is different in construction from the flexible skirt patents in suit. It has no relation, as I see it, to either Moorea or Schmiedeknecht. My conclusion is therefore that this piston is far worse than Exhibit B from a practical standpoint.

Q. What kind of fit is contemplated with that Rainforth piston? A. A spring fit.

Q. And just what do you mean by a spring fit? A. That the skirt of the piston would be originally prepared larger than the bore of the cylinder, and the piston would be sprung into the cylinder when the cylinder was cold.

Q. Then the piston would start with a tight fit and as it heated up what would happen? A. When it heated up it would be still tighter.

Q. If it would rub in the beginning, when it was heated up, what would happen? A. The piston could not function properly under these conditions; it would rub so tightly that there would not be enough power produced in the engine, or the piston would break due to poor mechanical strength, or it would seize.

Q. Was that piston ever used commercially, to your knowledge? A. No.

Q. Who is D. Napier & Sons, Ltd., of England? A. Well, they are, to the best of my knowledge, motor car manufacturers.

Q. They manufactured cars on quite an extensive scale, didn't they? A. Yes, they have in the past.

Q. Will you look at page 2 there and consider that the piston had been modified in the manner suggested in connection with the U-shape slots, and compare such pistons with the patents in suit? A. Apparently the U-shaped slots mentioned on page 2 of the patent are to be put in the "outer portion" of the piston, which is the skirt portion. The length of what I take to be the arms of the U, would run around the circumference of the skirt in some manner. The piston is supposed to be fitted similar to the piston with the vertical slots, indicating a spring fit. Such a piston would have no more bearing on the patents in suit than the pistons shown in Fig. 1 or 2 of the drawings.

Q. Will you state whether or not those pistons with the U-shaped slot also embody the spring fit with the resulting operations that you have already described? A. It is so indicated in the paragraph beginning line 6, page 2, that they are supposed to have the spring fit.

Q. Now, will you turn to the Spillman patent 1,325,176, and compare that in structure, mode of operation and results, with the pistons shown in each of the Jardine and Maynard patents? A. This Spillman piston has a head section and a guide section, the head section apparently being separated in part from the guide section by horizontal slots, and then the guide section is made flexible by means of two spiral slots extending from the bottom of the piston skirt almost half way around the piston, each spiral slot connecting with one of the ends of each horizontal slot. The Spillman piston is therefore a very flexible piston, in fact, it is so flexible that it is no good. The explosion forces on the head of the piston are transmitted to the thrust face in such a manner as to collapse the skirt metal in the so-called flexible tongues. For example, in Fig. 1 of the drawing of the patent, one of the so-called tongues may be indicated as the portion bounded by the horizontal slot and the spiral shown in solid outline. The end of the tongue would therefore be the intersection between the horizontal slot and the spiral slot. The end of the tongue

is so flexible that the entire wall pressure must be taken adjacent the end of the tongue by the remainder of the skirt. This produces an excessive stress on the large end of the other tongue, which may be regarded as bounded by the spiral slot, shown in solid lines, and the bottom of the skirt itself. The high stress on the large end of this tongue produces deformation and collapse which moves the small end of the same tongue inwardly from the cylinder wall permanently so that it does not bear on the cylinder wall. The result of this construction is that the piston skirt is not strong enough to stand the usage in a motor. Collapse of the solid portions obtains and the piston becomes unsatisfactory. The reason for this result is partly in the nature of the slotting, which is different from that shown in the Jardine and in the Maynard patents in suit. In the Jardine patent, for example, the thrust forces are resisted by the webs so that the skirt does not have the opportunity to collapse because it is not so highly stressed as in the Spillman construction. The fact that these slots in Spillman are put on both sides of the piston, makes the piston still worse than if the slots were put merely on one side. In the Maynard construction the horizontal separation and the vertical slot opposite that of maximum thrust, together with the web construction, gives the guide section not only flexibility but an ample strength to resist the collapse as a result of the thrust forces on the piston. The Spillman piston therefore does not have the same construction as Jardine or Maynard and it does not have the same mode of operation nor it does not give the same result. Its mode of operation insofar as the decrease in diameter of the skirt as a result of wall pressure, may be regarded as somewhat similar, but the manner in which the skirt is slotted in Spillman guarantees against successful operation, whereas the slotting, in combination with other features in Jardine and Maynard, is favorable to success.

The Master: We will recess until 9:30 Monday morning.

(Thereupon, at 9:30 A.M., Monday, March 20, 1933, the hearing was resumed.)

Mr. Richey: Defendants' counsel has asked us, in order to facilitate his policy with respect to the pistons of the Schoengarth patent, to announce our

views at this time with respect to the claims in suit of the Gulick patent, which we think, as we are at present advised, describe the 1911 piston that Mr. Gulick used in his 1911 tests, and the 1914 piston that Mr. Gulick used in his 1914 tests. Accordingly, in order to accommodate opposing counsel, we make the following provisional announcement:

The 1911 Gulick piston, claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 42 and 43; the 1914 Gulick piston, claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 38, 42 and 43.

With the consent of defendants' counsel I correct the following error which we made in the announcement of claims of the Gulick patent infringed.

We announced we were charging that claim 34 was infringed by Exhibit 3-O. This announcement should have been that we charged infringement of this claim by Exhibit 3-J. As corrected, the charge is that Exhibit 3-J infringed claim 34. We do not charge that Exhibit 3-O infringes claim 34.

Mr. Bruninga: As I understand, by the 1911 piston you mean the piston represented by Exhibit 48?

Mr. Richey: No, the one that he testified it was. Exhibit 48, as I understand it, doesn't exactly conform to what he testified it was.

Mr. Bruninga: What I had in mind, that motorcycle piston which had the circumferential ribs on it.

Mr. Richey: Well, what we had in mind in arriving at these claims was the piston that he tested in the Renault car.

Mr. Bruninga: That is all right. Now, as to the 1914 piston, it is the one represented by Exhibit 51.

Mr. Richey: It is the aluminum piston.

Mr. Bruninga: The aluminum piston represented by Exhibit 51 which was tested in the Amplex car?

Mr. Richey: I think Exhibit 51 conforms exactly to his testimony, I am not certain.

Mr. Bruninga: Now, I notice that there are a number of these claims applying to the 1911 and 1914 pistons, and my recollection is not clear whether any of those are relied upon as being infringed. I mean, were all of them being relied upon as being infringed by one or more of the exhibits?

Mr. Richey: Well, we only announced the claims in suit.

Mr. Bruninga: Now you made a statement it was for the purpose of enabling me to take a position with reference to Schoengarth. I want it understood that is not the only purpose. The purpose was to make you state your position before it was determined whether I was to take any further evidence.

Mr. Richey: Well, that is the only purpose for which you asked that we state it, and the only purpose for which we have stated it.

Mr. Bruninga: Well, the record will show that. I don't want to commit myself.

Mr. Richey: As I said the other day, and as the Master well knows, the claims are interpreted in the light of the prior art, and it is not fair to ask us to interpret them and pass upon the prior art, but we are willing to accommodate you, and we have. Are you ready to go ahead?

Mr. Bruninga: Yes.

FURTHER DIRECT EXAMINATION OF MR. JEFFRIES
by Mr. Richey.

Q. Doctor, do you know whether or not any efforts were made to commercialize the piston shown in the Spillman patent 1,325,176, and if so, you may state what you know about it and what the results of such an effort were, that you know was made? A. Yes, the Kant Skore Company in Cincinnati tried to commercialize the Spillman piston and the results were very poor.

Q. What happened to the piston when it was used in commerce, if you know? A. The pistons collapsed so in the slotted or tongue portions that they became useless or unsatisfactory in operation; also there was hard rubbing on parts of the piston bearing surfaces nearest the bosses and very little bearing pressure at the thrust faces.

Q. State whether or not the use of these pistons was discontinued commercially, if you know? A. Yes, so far as I know no piston like this is being manufactured today, nor has such been for a good many years.

Q. Was any piston substituted for it by the Kant Skore Company, and if so, what piston? A. Yes, the split skirt type of piston as characterized by the Maynard patent was generally substituted for the Spillman piston by the Kant Skore Company.

Q. Will you next take up the patent to Long, 1,395,441, and compare the piston illustrated and described therein with the piston of the Jardine and Maynard patents in suit? A. This Long piston in patent 1,395,441, is a single-walled piston with special slotting on each of the thrust faces of the skirt or guide section of the piston. On one side is a T-slot, as shown in Fig. 2, and on the other side is a complicated slotting consisting of a U, or more accurately, a rectangular shape with one side of the rectangle missing, and a vertical slot extending from the bottom of the slot to approximately the line between the two bosses, as shown in Fig. 1. From the drawings it would appear that the slot is entirely in the guide section and therefore the horizontal slots do not separate the guide section from the head section. If that is a fact the slotting can do no good because the piston would seize in the guide section just above the horizontal slot where the piston would be the hottest. Furthermore, there is no relief around the boss section, and with no relief the piston could not conform to the cylinder wall at the top of the skirt, even by utilizing distortion, because the piston would exert pressure against the entire circumference. The Long piston, therefore, does not have the guide section separated from the head section by a horizontal slot, as in Jardine, nor is there relief around the bosses in combination with the slotting, as is found in Jardine. This piston, therefore, does not have the same construction as Jardine and it does not have the same mode of operation as Jardine, and it therefore cannot give the same results as Jardine. The analysis with respect to Jardine is also applicable to Maynard. The Long piston does not have the same construction as Maynard, nor the same mode of operation, nor can it give the same results.

Q. Will you answer the same question with respect to the Long piston shown and described in the Long patent, 1,489,499? A. This piston is a double-walled piston, as shown clearly in Fig. 5, which is a cross section through the bosses. It has a complicated set of slots, shown in Figs. 1, 2 and 3. The slotting on one of the thrust faces, as shown in Fig. 1, is rectangular, with one of the sides of the rectangle missing. It may be described also as one horizontal slot with two vertical slots extending one from each end of the horizontal slot to the bottom of the skirt. This is the side which is double-walled, as is shown in both Fig. 4 and Fig. 5. The other thrust face is slotted with one horizontal slot and two

vertical slots, which connect the ends of the horizontal slot but do not go down to the bottom of the piston skirt. This piston does show a horizontal separation between the guide section and the head section. This separation is clearly shown at numbers 11 in Figs. 1, 2 and 3. There is, however, no boss relief in combination with the slotting. The piston in my opinion would have a certain degree of wall or skirt flexibility in operation. As compared with Jardine the construction is different, as can be clearly seen. Jardine has in one of its constructions a double wall at the head of the piston but in neither of his constructions does it have a double-walled skirt section. In one of the Jardine constructions there is no double wall in any portion of the piston. So from the standpoint of a double-walled skirt section, the Jardine construction is different from that of Long. Jardine has a simple system of slotting, as opposed to Long's complicated system of slotting, and Jardine uses boss relief in combination with horizontal and vertical slotting, which is not found in Long. The mode of operation of Jardine is therefore different from the mode of operation of Long, and the result is also different.

The Long construction is not like the Maynard construction. In the first place Maynard shows nothing but a single-walled structure. The Long construction does not have the combination of flexible webs and horizontal and vertical slotting with relief, as shown in the Maynard patent. The mode of operation of Maynard therefore is different from the mode of operation of Long, and the result is also different.

Q. You are asked the same with respect to the Long patent 1,872,772? A. This construction is a complicated one, having double-walled sections around each of the bosses of the skirt section. The piston, when completed, has two horizontal slots and six vertical slots, each of the six vertical slots connecting the horizontal slot with the bottom of the piston. The horizontal slot does also in this patent separate the head section from the guide section, as is shown by the numbers 12 in Figs. 1, 2 and 3. The drawings show no relief around the bosses, so that there appears to be no combination of horizontal and vertical slotting with boss relief in this patent. The construction is clearly different from that of Jardine, both in the double-walled nature of the skirt and in the system of slotting and the absence of boss relief. The mode of operation of the Long construction is quite com-

plicated but no doubt a certain amount of flexibility is gained in the skirt section as a result of the web construction and the series of slots. The mode of operation, however, is different from that of Jardine and the result is also different. This is true also of Maynard. The construction is clearly different from that of Maynard and the mode of operation is different and the result is also different.

Q. Now, would you supplement your last answer by including the same comparison of Exhibits E and F with the Jardine and Maynard patents? A. Exhibits E and F appear to be similar to each other, with the exception of the ribbing inside the piston head. This ribbing would appear to make little difference in the general construction, mode of operation or results of the Exhibits E and F, so I can, for the sake of brevity, compare piston Exhibit F with the Jardine and the Maynard constructions.

Exhibit F is a double structure with the six vertical slots and two horizontal slots, as described in the Long patent just previously discussed. The horizontal slots appear to separate the head section from the guide section. There is also relief around the bosses in Exhibit F which was not described in the Long patent itself. This relief around the bosses would, in my opinion, make the piston function better than without such relief and would bring the mode of operation of this Exhibit F nearer to that of Jardine. The mode of operation, however, would still be different because of the double-walled nature of the skirt and the complicated system of webs and slotting. The result, insofar as functioning, would somewhat simulate that of Jardine, but the piston would be much more expensive to manufacture and it would be heavier and would therefore not give the complete results of the Jardine construction. This particular piston head shows that the side opposite from the one bearing the exhibit tag, has collapsed in service. The gases have been blowing clear by the piston, as shown by the excessive carbon deposits at the bottom of the skirt under that boss. There has also been some collapse apparently in one of the thrust face sections, as shown by the carbon accumulation on it. There has also been fairly hard rubbing on one or the other thrust faces just opposite the end of one of the cross webs. So that, apparently, this particular piston did not function properly in service. As compared with the Maynard construction, the

same analysis holds. The construction is different from Maynard and the mode of operation, even though the relief is present in Exhibit F around the bosses, is different from that of Maynard, and the result is different. One of the differences between Exhibit F and Maynard is in the nature of the bottom of the skirt. The bottom of the skirt in Exhibit F has six openings in it as compared with one in Maynard. It can be seen by examining Exhibit F that the carbon deposit is found in each one of the six vertical slots. So that the result obtained with Exhibit F is inferior to that obtained with Maynard.

Q. There is some testimony in this record to the effect that Long pistons were used by the Franklin Company commercially. State, if you know, who made the castings that were employed in the manufacture of these Franklin pistons? A. I don't know who made all of the castings, but I know the Aluminum Company of America made castings for the Franklin Company over a considerable period of time.

Q. Do you know when that period began? A. Well, I don't know, not from the standpoint of making a record of it, but I think it was some time along 1920 or thereabouts to about 1926.

Q. One of those pistons bears the name of Levett, Exhibit E? A. Yes, Exhibit E does.

Q. And who was Levett? A. Levett was a manufacturer of pistons and other aluminum castings.

Q. Is that the Levett that was referred to as formerly a licensee under the patents in suit? A. Yes.

Q. This piston also bears the following notation: "Pat. 3-4-19." That is the date of the main process patents which you were asked about formerly in this case, isn't it? A. Yes.

Q. Are you familiar with any of the activities of the Aluminum Company of America in its work in connection with this Franklin piston made after these Long designs? A. I don't know that I understand quite what you mean.

Q. (Question read by reporter.) A. Well, I am familiar with quite a number of things that happened.

Q. Just state in a general way what those activities were. A. Well, the Aluminum Company didn't like to manufacture this piston, for one thing, because it is a difficult piston to manufacture in a permanent mold, but various other designs were submitted to Franklin and some time along about 1926 they adopted the Invar Strut

piston, which became standard at that time and is standard with Franklin at the present time.

Q. Will you next take up the British patent to Hives 140,968, and compare it in structure, mode of operation and result with the piston shown in the Maynard patent in suit? Will you look at the original copy of this patent instead of using a photostatic copy. A. The Hives piston is the trunk type piston divided into a head section and a skirt or guide section. The division between the head section and the skirt section being at one of the grooves containing some oil holes, the oil holes being designated as "d^2"; the groove itself is designated "d^1." The fact that the oil groove "d^1" separates the head section from the guide section is clearly evident by placing dividers across the head section and then noting that the same setting of the dividers does not encompass the diameter of the skirt section. Therefore the T-slot, which is found in the Hives construction, is entirely in the guide section. The horizontal separation is far enough below the separation between the guide part and the head part to prevent the flexing of the piston in the flexible portion from functioning properly or satisfactorily in a motor. If the piston were given the proper clearance for the top of the skirt, the T-slot would have no opportunity to do any good by flexing. There is a suggestion that one part of the skirt may be ground oval. This is included in the paragraph beginning line 32, of page 1; there are two slotting constructions suggested, one being a T-slot and the other an H-slot, and if the T-slot is used the part to be ground oval would be from the horizontal slot A downward to the bottom of the skirt. If the H-slot is to be used, the oval grinding would be between the two horizontal slots, in accordance with the paragraph to which I have referred. The drawing in cross section, as shown in Fig. 2, indicates by measurement with dividers that the skirt is somewhat oval on the section given. The larger diameter, however, is across the bosses, where it certainly could do no good in this particular piston. I think it would make very little difference where the oval had its greatest diameter, however, because the piston would not function properly as a flexible skirt unit anyway, as compared with Maynard. In the first place, the main construction is different in that the Hives piston is the regular trunk type piston with no relief around the bosses. The Maynard piston consists of the head section with webs relieving

the skirt in the boss section, and a full diameter skirt at the bottom, the head section and guide sections being divided into two parts by the horizontal slots, and the skirt portion being flexible by joining the horizontal slots with the bottom of the piston in one of the thrust faces. The Hives piston showing no horizontal separation at the division between the guide section and the head section, is, therefore, entirely different in construction from the Maynard construction. The Hives construction has a different mode of operation from that of Maynard and it could not give the same result as Maynard.

Q. You said that the long axis of the oval ellipse was along the bosses in the Hives patent. Upon what do you base that statement? A. On measurements made with dividers on the drawing in the certified copy of the Hives patent.

Q. And who made those measurements? A. I made the measurements.

Q. Would you take this copy that has been offered in evidence and measure that also? A. (Witness complies) The same is true of the copy which has been offered in evidence.

Q. Will you now look at Defendants' Exhibit 3-Q, which is said to be a Franquist piston, modeled after the piston shown in the Franquist patent 1,153,902, which you discussed in your prima facie testimony. The defendants' expert suggested certain changes in this piston which are as follows: (Record 737) "The walls of this piston and the slots may be made thinner, the length of the slots could be increased, which would increase the lever arm and make the slots more flexible. • • • Q. And what would happen if you cut all the way through a slot on one side of the wrist pin, one on either side? A. That would make that side of the skirt adjacent to this cut very flexible." As I understand it there are three proposed changes. Will you take up the Franquist patent, as modified in each of these ways, and compare it in structure, mode of operation and results, with the patents in suit? You may use any sections of the Franquist piston which you have cut out, in answering the question.

Mr. Bruninga: I don't want to make any objection to this witness again going into the Franquist patent and models which were fully discussed on prima facie, but I simply want to reserve my right to offer surrebuttal evidence later on.

Mr. Richey: The facts are these: he asked him about the Franquist patent in prima facie cross examination. I objected to it as improper. And then we went into it and defendants' expert came along and proposed to modify the Franquist piston in three different ways. Now, I have asked the witness to compare the piston thus modified.

The Master: I think I understand the situation. I will pass on that question when it arises.

(Short recess taken.)

Mr. Bruninga: I also want to make an objection that the plaintiff in this case is estopped to deny the operativeness and utility of the structure of the Franquist patent 1,153,902, and is estopped to deny that it covers and even discloses the subject matter of the main piston involved here, which is Plaintiffs' Exhibit 1. I want to at this time hand the Court the printed record in 6264, the *Cleveland Trust Company and Chrysler Corporation, appellants, vs. the Simmons Manufacturing Company,* which is now pending in the Circuit Court of Appeals for the Sixth Circuit. I stated before I was going to get a copy of this and substitute it for one of the papers in this case.

The Master: Is this my copy now?

Mr. Bruninga: That is your copy, your Honor.

Mr. Richey: Are you offering this in evidence or marking it in evidence?

Mr. Bruninga: Yes, I will find out later on. I will mark it for identification later, just as soon as I can get the list of exhibits because I want to substitute it for one of the papers in the file that I offered in evidence.

Mr. Richey: The sections which the witness has produced I mark for identification 71-A and 71-B.

A. Taking the first suggestion of Mr. Stellman to make the walls of the piston thinner and the walls of the ribs thinner to gain flexibility, it is my opinion that if the walls are made thin enough to produce useful flexibility, the mechanical strength of the piston would not be great enough to withstand the stresses imposed during service. The second suggestion that the ribs be extended in length, that is, axially, toward the vertical axis of the piston, would to my mind also be ineffective in producing flexibility because the extension of these ribs towards the axis would continue to add an element of

rigidity which would defeat the desired results. There is, furthermore, a physical limit on the extension of the ribs axially because of the needed room inside the piston skirt for the connecting rod connection, and operation. Such a construction would also add to the difficulty of making such a piston, to its weight and to its cost. I do not believe, however, that the added flexibility would result even if the ribs were extended axially. The third suggestion that the slot be extended completely through one of the ribs on each side of the piston, would not produce the desired result, in my opinion. There would be in that case one diameter of the piston which would be rigid and hard rubbing and eventually seizure would occur across this rigid diameter. Immediately adjacent the completed slot one of the skirt surfaces, that is the skirt surface on one side of the slot, would be quite flexible, and the skirt surface on the other side of the slot would be rigid. None of these changes, to my mind, would therefore make the piston, as modified, the same construction as that of any of the patents in suit, and the mode of operation would be different and the result would be different.

I have here two parts of a piston of the Franquist type, which piston was given to me by Mr. McCoy. In order to get an idea of the flexibility of the skirt portion as a result of the slotted ribs described by Franquist, I had the head portion separated from the skirt portion. The head portion is marked 71-A, and the skirt portion is marked 71-B. The skirt in this piston would appear to be somewhat thinner and the rib walls thinner than in Defendants' Exhibit 3-Q. The head, when it is attached to the skirt, has a very powerful tendency to keep the skirt from flexing. To obtain the flexibility of the skirt itself it is therefore necessary to separate the skirt from the head. It can be readily seen that even the skirt itself of the Franquist construction is very rigid, simulating the stiffness of a trunk type piston.

Mr. Richey: I offer the two piston parts referred to by the witness and which were marked for identification Plaintiffs' Exhibits 71-A and 71-B in evidence by those numbers.

The Master: If there is no objection they may be received.

Mr. Bruninga: With the same reservation and the same objection.

The Master: With the same reservation.

Q. Have you a section of the Maynard type of piston similar to 71-B, by which you can show the differences in the operation between the two? A. (Witness produces same.)

Mr. Richey: I ask that these two parts be marked for identification 72-A and 72-B.

Mr. Bruninga: With the same reservation and the same exception.

The Master: They may be received with the same reservation.

A. I have here a Maynard type piston which has been cut into two parts, the separation in this case being made in the skirt section proper, immediately below the horizontal slot. The great flexibility of the skirt section itself can readily be seen or determined by hand flexing.

Mr. Richey: I offer in evidence Plaintiffs' Exhibit 72-A and 72-B the parts so marked for identification and referred to by the witness in the last preceding answer.

Mr. Bruninga: Same reservation and same objection.

Q. Will you next take up the Ebbs patent 700,309, and compare the piston illustrated and described therein in structure, mode of operation and result, with the pistons of the patents in suit? You might supplement your answer by making the same comparison with the piston which is illustrated in Defendants' Exhibit 4-B. A. In the first place this Ebbs piston is a composite piston; it is very complicated in construction. The complicated construction, according to the patent, is resorted to for the purpose of making the skirt part replaceable rather than discarding the whole of the piston. In order to make the skirt part replaceable it is divided into two halves, "f". The putting on of these two halves makes a horizontal separation between the head section and the skirt section, and the halves are necessarily divided in such a manner as to make in the skirt, when assembled, two vertical separations which appear in construction to be slots. In that broad sense the piston has a horizontal separation and a vertical separation. The horizontal separation, however, has no function, at least, in flexing, nor do the vertical separations have any function whatsoever in producing flexibility. The skirt of this piston must be arranged in such a manner as to provide full clearance when the piston is in operation. This is pro-

vided beyond any doubt by the construction itself. There is a cross-bridge construction inside the skirt of the piston which holds the connecting rod. There can be no possible reduction of diameter by flexing or distortion across the thrust faces. The vertical slots in this piston are therefore not in the thrust faces. These vertical slots are perpendicular to the thrust faces. The region at the ends of the structure holding the connecting rod will be hottest in the piston described. Heat will be conducted from the piston head through the rod "d" to the connecting rod support. From there it will be conducted to the skirt so that the hottest part of the skirt would be at the ends of the connecting rod support. There is no relief shown in the region of the thrust faces or in any manner which would make it possible to operate the piston at less than the normal full clearance to operate a completely solid piston. The wall sections are such that even if flexibility could be utilized to compensate for extra expansion, the structure would be quite rigid. The Ebbs construction, therefore, in addition to being very complicated, is one in which the mode of operation is essentially that of a solid, rigid, non-flexible type piston. There is no mention in the patent that the skirt is supposed to be flexed, and there is no mention that the skirt can be fitted closer than with a conventional type of piston. This Ebbs construction, therefore, adds nothing to the flexible skirt type of piston. Its construction is wholly different from that of any of the patents in suit; its mode of operation is that of a solid and rigid skirt piston, and its result is that of the solid or rigid type of piston and not that of the flexible skirt patents in suit.

Considering the so-called modification of the Ebbs patent as shown in Fig. 4-B, the modification is apparently made in order to bring the vertical separation of the two skirt halves into the thrust faces instead of at right angles to the centers of the thrust faces. If the construction in Exhibit 4-B is made, there would be some possibility of the vertical slots functioning, if they could do any good, and if the sections were made proper for flexibility; but there is no justification in the Ebbs patent for placing the vertical separation in the thrust faces, and, furthermore, there is no possibility that such a construction, even as modified in Exhibit 4-B, could function as a flexible skirt piston. Again, the rigid cross member supporting the bosses would be non-deformable, and there is no boss relief shown, so the full clearance of the skirt must be provided in the boss diameter of the

figure 4-B. Even after such a piston were constructed, it would be of no use whatsoever. No one would think of constructing a piston like is shown in 4-B for commercial operation in these days; the expense would be unbearable and the composite nature would be unsatisfactory, and the functioning of the piston would be at least no better than that of the trunk type piston. The whole Ebbs disclosure, it seems to me, has no bearing on any of the patents in suit.

Mr. Bruninga: I want to object to this witness' answer on the following grounds: here, again, plaintiff is estopped to take the position that the Ebbs patent does not disclose anything of the patents in suit, or that it has no flexibility, or that the vertical slot has no function at all. The law examiner's decision in the interference in which the Gulick patent was involved distinctly established that there was no invention in a splitting of the Spillman & Mooers patent structure in view of the Ebbs patent. Now, there was no appeal taken from that decision; the claims were deliberately cancelled by the owner of the patent.

Mr. Richey: Not the claims in the patent, of course.

Mr. Bruninga: The claims rejected by the law examiner were deliberately cancelled, so that establishes a condition of estoppel, and this witness is now taking the position just contrary to the position of the Patent Office, which was not appealed from at all. I just want to make my objection at this time.

The Master: Objection will be noted.

Mr. Richey: Of course we challenge all that.

Q. Will you next take up the Chenard & Walcher patent 468,595, and compare that in structure, mode of operation and results with each of the patents in suit? You can use the translation that has been offered in evidence with the Chenard & Walcher patent. A. This Chenard & Walcher patent refers to a piston with a horizontal separation only between the head section and the guide section. It is stated in the patent that it had been the practice previously to grind the cylinders in a special way to accommodate the method of expansion of the piston. This was done on a special copying lathe and was not a simple machine shop operation. It is also stated that by this invention it is made possible to machine the skirt of the piston in the ordinary lathe. That

means that the machine ground and need not be bothered with the technique of the special shapes obtainable with the copying lathe. The means for producing this is a specially designed piston with connectors running directly from the flat of the head to the bosses, so that the skirt can be entirely separated from the head portion horizontally. In this way it was hoped that the heat would pass from the head directly down to the boss region and by-pass the top of the skirt section, thereby keeping the skirt cooler than would obtain with a piston having the head section attached to the skirt section at its periphery. There is not any evidence in the patent specifications nor in the drawings that a flexible skirt was contemplated. In fact, everything is in the direction of having a non-flexible skirt which is supposed to operate better because it is kept cooler. The piston shows no relief of the skirt section around the bosses or any place else. In other words, the skirt is supposed to be cylindrically finished. This piston being a non-flexible type piston has a different construction from Gulick, Jardine and Maynard, a different mode of operation, and gives different results. It does not embody the Mooers principle because there is no relief in combination with the horizontal slotting. It does not embody the Schmiedeknecht invention because the nature of holding the bosses, and the bottom skirt regions, is different from the Schmiedeknecht construction.

Q. Would you make the same comparison between the piston disclosed in the Chenard & Walcher patent and this Ray Day piston of Plaintiffs' Exhibit 81 A. The general construction of the Chenard & Walcher piston is quite similar to that of the Ray Day piston, with the exception, of course, of the vertical slot in one of the thrust faces of the Ray Day piston. This vertical slot not only changes the construction but it changes the mode of operation and results of the piston. There are, however, some other differences. Chenard & Walcher apparently desired a rigid piston. Their construction is rigid. The rib or ribs across the head, is in the direction of rigidity. It is not clear from the drawing how many ribs there would be across the head, but in any event the rib or ribs would militate against the flexibility of those webs. Furthermore, the construction of the web section, according to one of the paragraphs in the patent, could be annular in the Chenard & Walcher; in this case the construction would be quite different from that of the Gulick piston, Plaintiffs' Exhibit 8.

There is also a horizontal rib at the bosses in the Chenard & Walcher construction, as shown in Fig. 2, the extent of which is uncertain from the drawing, and I think quite unobtainable from the drawing. At least, I see no possible way of arriving at the vertical thickness of the rib shown around the bosses in Fig. 2 of the Chenard & Walcher patent.

Mr. Richey: Marked X on the Chenard & Walcher patent in evidence.

The Witness: In the Ray Day piston, Exhibit 8, there is also generous boss relief which is not found in the Chenard & Walcher patent or drawing. So that the Ray Day piston, Exhibit 8, has a different construction, different mode of operation, and gives a different result from the Chenard & Walcher construction.

Q. Will you next take up the patent to White 1,495,936, and compare that with each of the patents in suit in the same way? A. This patent appears to deal with a very specially constructed piston, in which the wrist pin of the connecting rod shifts during the stroke. The design apparently was made so that the shifting wrist pin take most of the load and a centrally designed wrist pin takes none of the strain due to the shifting of the position of the rod. I cannot see where this patent has any bearing on the patents in suit at all; a very complicated piston-wrist pin arrangement; I never heard of its being used any place. I don't see any arrangement for flexing the skirt or anything of that sort. I don't see where the patent has any bearing at all on the patents in suit.

Q. Will you next answer the same question with respect to the piston illustrated and described in the Anderson patent 1,283,021, making that comparison with respect to Gulick, Jardine and Maynard only? A. This Anderson piston is what might be described as a skeleton type of piston, or slipper type of piston, in which the slipper surfaces are not separated from the head section, that is, the piston has no horizontal slotting and has no vertical slots. It is, therefore, not a flexible piston and has different construction and a different mode of operation, and gives a different result from either Gulick, Jardine or Maynard.

Q. Now, will you next take up the French patents to Serex, 434,147 and 16,362, and compare the disclosures therein with each of the disclosures of the patents in

suit? A. Considering both of these Serex French patents together, the part I believe that was stressed by Mr. Stellman was the valve piston, and particularly the horizontal and vertical slotting in such valve piston, as shown in Figs. 1 of both of the patents. In the first place, these valve pistons are not pistons for internal combustion motors in the sense that the patents in suit are. The pistons do not have a head section separated from a skirt section by a horizontal slot. The pistons are relatively light, not requiring the strength of a piston which must impart the explosion force to the operating mechanism of a vehicle. The slotting in this case is made in place of the rings, apparently. There appear to be no other rings to seal the wall between the piston and the cylinder. In the patent 16,362, Fig. 1, it is clear that even the horizontal separation comes below the boss, there is only a small portion of this piston slotted two ways to make it serve as a spring ring in the valve piston. There is no combination of horizontal and vertical slotting and relief. The main body of the piston is apparently fitted to run fairly snugly in the cylinder. These patents do not represent the construction of the flexible skirt patents in suit; they don't operate like the flexible skirt patents in suit; and they don't give the results of the flexible skirt patents in suit.

Q. Will you next take up the British patent to Fairy 12,772, of 1914, and make a comparison with the disclosures in the Gulick and Schmiedeknecht patents? A. The Fairy construction is apparently that of a composite piston, where the head and skirt portions are made in one piece, and the boss connection is made in another piece and riveted or otherwise attached to the skirt of the piston. There is no horizontal separation or vertical separation, so the piston does not have a flexible skirt. It has no bearing, as I see it, therefore, on the Gulick patent in suit. Insofar as the Schmiedeknecht patent is concerned, the Schmiedeknecht patent is an integral structure, as opposed to a composite structure. In that sense the two structures are different, and the boss section seems to be entirely supported on the riveted-in webs in the Fairy patent, whereas the boss in Schmiedeknecht is supported in part by the web and in part by the skirt near the head section in the Schmiedeknecht construction. The Fairy patent, as I see it, therefore, has no bearing on the Schmiedeknecht patent.

Q. Will you next look at Figs. 3 and 4 of the British patent to Pugh, 17,256, and the descriptive matter refer-

ring thereto, and compare the disclosure thereof with the pistons disclosed in the Gulick and Schmiedeknecht patents in structure, mode of operation and results? A. This is a built-up piston, almost of tin can construction. The Pugh piston in my opinion would not function satisfactorily in a motor anyway on account of the thinness of the various sections, and because there would be no adequate bearing in the head portion. The piston is also a double-walled one, in the head section, and to an extent around the bosses. The Pugh construction is therefore different from the Schmiedeknecht construction and it would also operate differently and give a different result.

Q. I now hand you a piston which I have marked for identification Plaintiffs' Exhibit 73. State what that is, if you know. A. I believe that is one of the Ricardo type pistons which was discussed in my prima facie examination relating to the tests on Ricardo type pistons in the laboratories of the Aluminum Company of America.

Mr. Bruninga: I don't want to object to this. I think it was brought up on prima facie, but I again want to make a reservation that I may want to ask for surrebuttal testimony on this.

The Master: Same ruling on that.

Mr. Richey: Of course his position is this: he discussed these Ricardo pistons with his experts and now we are answering him.

Mr. Bruninga: Yes, but I asked particularly about the production of some of these pistons on prima facie and they weren't produced.

Mr. Richey: I offer that in evidence as Plaintiffs' Exhibit 73.

Q. Is that like any of the pistons shown in this Defendants' 3-S? A. It is approximately like Fig. 2 in Defendants' Exhibit 3-S, with the exception that Fig. 2 has some ribbing in the head which is not found in Exhibit 73.

(Thereupon, adjournment was taken to 1:30 P.M.)

(At 1:30 P. M., same day, Monday, March 20, the hearing was resumed.)

Q. I next call your attention to the Venner piston illustrated in Defendants' Exhibits J and K, and ask you

to compare that in structure, mode of operation and results with the pistons shown in the Jardine and Maynard patents in suit? A. The drawing in Defendants' Exhibit K is somewhat different from that shown in Defendants' Exhibit J, especially in the web construction, but the differences appear to be of minor importance. I can, therefore, discuss Exhibit J as representative of both exhibits. This piston is double-walled in both the head section and the skirt section. There is a partial horizontal separation between the head section and the guide section. The piston has no relief around the bosses or on the skirt section, so in that respect the construction is different from both Jardine and Maynard. As I view the Venner construction, there would be little if any flexibility across the thrust faces. The side walls of the skirt would have some flexibility, especially at the bottom, but the rib construction is such as to militate against even the flexibility of the side sections of the skirt. Insofar as the Venner piston is double-walled in both the head portion and the skirt portion, it differs decidedly in construction from both Jardine and Maynard. The combination of horizontal and vertical slots, properly placed in a guide section, with relief, as found in both Jardine and Maynard, is absent in Venner. The mode of operation of the Venner construction is therefore different from both Jardine and Maynard, and the results would be different.

Q. In your discussion of the Monckmeier piston you gave some dimensions in reference to those pistons. Have you produced drawings showing those dimensions? A. Yes, I have two drawings, one showing the dimensions superimposed on the Monckmeier cast iron piston, and the other the dimensions superimposed on the Monckmeier aluminum piston, Defendants' Exhibit 3-W.

Mr. Bichey: The drawing showing dimensions on Defendants' Exhibit 3-V is offered in evidence as Plaintiffs' Exhibit 74, and the drawing showing dimensions on Exhibit 3-W, is offered in evidence as Plaintiffs' Exhibit 75.

Q. At page 840 of the record, Mr. Stellman, defendants' expert, testified as follows: "Yes, I should say that not every feature in each patent in suit was covered by any one patent which I might have picked out." Do you agree with that statement or not? A. I agree with it,

Q. Mr. Stellman produced a vector diagram, Defendants' Exhibit 4-A, and discussed the same in connection with the operation of the piston like Exhibit 1. Will you take that diagram and state whether or not you agree with Mr. Stellman, and if not, state your reasons? A. Defendants' Exhibit 4-A is a drawing showing a cross section of Plaintiffs' Exhibit 1 type of piston, just below the horizontal separation between the head portion and the guide portion. As I understood Mr. Stellman's testimony, the effect of the various forces on the piston at point A, Defendants' Exhibit 4-A, would be such that this point would have no flexibility. In order to ascertain the facts, I had a piston similar to Plaintiffs' Exhibit 1 cut in two on the section represented in Defendants' Exhibit 4-A. When the piston is separated in two parts in that manner, it is clearly seen that the whole of the skirt section becomes very much more flexible in the detached state than it is when attached to the head of the piston. From rather rough measurements which I made with the help of some bathroom scales, it indicates that the flexibility of the bottom of the skirt of a piston like Exhibit 1 is only one fifteenth as great with the skirt attached to the head in the manner of attachment in Fig. 1 as when the skirt is detached from the head as shown in Exhibits 72-A and 72-B, particularly 72-B. In other words, it takes 15 times as much pressure applied on the bottom of the skirt to close the slot in Exhibit 1 as it does in the detached skirt Exhibit 72-B. This shows the tremendous effect of one part of a piston on other parts, especially in these flexible type pistons. In the head portion containing a small part of the skirt section, in Exhibit 72-A, the flexibility of the skirt portion can then be readily demonstrated by pressure of the two thumbs on the slotted portion. This shows beyond any question that the skirt portion, even though it is attached to the head portion, has flexibility resulting from the combination of vertical and horizontal slotting. I found it possible in a piston which was supposed to be similar to Plaintiffs' Exhibit 1 to flex the webs at point A in Defendants' Exhibit 4-A merely by applying pressure on the bottom of the skirt with one hand. I have a micrometer on Plaintiffs' Exhibit 1 now across the two points corresponding to A. The diameter across the two points is 2.6085", approximately. If someone will turn the micrometer screw while I press on the bottom of the skirt. (This is done.) The reading at the present position appears to be 2.6085.

I will now press on the bottom of the skirt, merely with one hand. The reading on the micrometer as it was turned up while I was pressing is 2.595. That is a considerably greater deflection than I was able to effect on the other piston so I think it would be well for me to check it. I will make a new measurement across the point A without flexing. The measurement I obtain now is 2.6070. Now if some one will turn the micrometer wheel, while I—(This is done.) After I flexed the bottom of the skirt with one hand, the reading is 2.595". That is still considerably more flexibility than I was able to obtain on the other piston. I am afraid in screwing this up, you may have taken hold of the smooth part of the handle. (The one who assisted the witness): I did in both cases.

The Witness: Well, I only took the knurled part of the handle. The smooth part is attached rigidly to the micrometer, and the knurled part is attached movably to the micrometer; that is the difference. Now, the diameter in the unsprung state is 2.5985. So, if someone will turn the ratchet now, taking hold of the knurled part only (ratchet turned by Mr. Richey). Now the reading, after turning the micrometer up in the sprung position is 2.592. That is more in line with the amount that I was able to spring the other piston supposed to be similar to Plaintiffs' Exhibit 1.

There is another way of demonstrating the movement of the webs at the point A in Defendants' Exhibit 4-A. I just fastened the micrometer across the point A in Exhibit 4-A and screwed it tight enough so that its own pressure against the walls of the web would hold the weight of the micrometer by gravity. Then by taking hold of the bottom of the piston and springing it with one hand, the micrometer dropped off of the piston. Both the measurements and the tests just described demonstrate clearly that in Exhibit 1 itself there is measurable flexibility of the webs at point A in Defendants' Exhibit 4-A.

In this connection I should like to mention also the horizontal slot in Plaintiffs' Exhibit 1 is not put in in quite the same way as the horizontal slot in the Maynard patent drawing. The horizontal slot in Plaintiffs' Exhibit 1 is put in by a groove tool so that the web is cut on the bias or at an angle. In the Maynard patent drawing the horizontal slot is cut more nearly straight through the webs. As shown in the Maynard Fig. 1, for example,

the web flexibility would probably be more than in Plaintiffs' Exhibit 1, varying, however, merely in degree. The turning in of the webs at their outer ends in Plaintiffs' Exhibit 1 makes them more flexible in the thrust direction than the webs shown in the Maynard patent. So the flexibility of the webs at the top of the skirt in the Maynard patent, in my opinion, would be very appreciable and certainly enough to function in a helpful way in the operation of the piston. The amount of flexibility found by micrometer measurement just now is considerable from the standpoint of piston clearance, which is measured in thousandths of an inch and some times in ten-thousandths of an inch.

Mr. Bruninga: I want to make the same reservation with reference to Exhibit 1 as to its flexibility, as already made to some of the questions. This matter was also discussed on the prima facie proof and most of this witness' answer is simply an accumulation or new argument to what he said before rather than a plain rebuttal of this Exhibit 4-A.

The Master: The same ruling on that. We will pass on that.

Mr. Richey: Pass on that when we come to it.

Q. Doctor, have pistons of the Maynard type without this relief shown at A been used commercially, and if so, in what quantity?

Mr. Bruninga: That, your Honor, was fully covered on prima facie. If you have some new angle on it—

The Master: Let him answer.

Mr. Richey: I can tell you what the difference is, if you want to know.

A. Yes, they have been used commercially and in large quantities, say in the hundreds of thousands.

Q. Will you compare this Exhibit 3-J in structure, mode of operation and result with the Gulick patent in suit, considering that the slit in Exhibit 3-J is cut through at both ends, in answering the question? A. This Defendants' Exhibit 3-J is, I think, a piston for the Ford V-8, 1932 model. It is quite a refined piston, both from the standpoint of its design and its final preparation for use in a motor car. It has a flexible skirt, when the vertical slot is completed, and the piston is divided into two main parts, the head part and the skirt or guide part, by a horizontal slot at the top of one of the thrust

faces. This combination of horizontal and vertical slots, the horizontal slot separating the head section from the guide section, will function the same as the combination of horizontal and vertical slotting in the Gulick construction. This piston, Exhibit 3-J however, has not only boss relief in combination with these other things, which is not found in Gulick, but the piston is also cam ground; that is, the machining of the piston in the plant before it is put into the car is quite special. The piston therefore embodies features not described in Gulick, but which depend for its successful operation on the combination of horizontal and vertical slotting, the horizontal slot separating the head section from the guide section, and thereby gaining flexibility of the skirt section, in so far as the skirt is flexible as a result of that combination, and Defendants' Exhibit 3-J has a mode of operation similar to Gulick and would obtain the same results as Gulick.

Mr. Bruninga: Same reservation as to surrebuttal.

The Master: Same ruling.

Q. Look at Defendants' Exhibit 3-O and compare that with the Gulick patented piston and the Mooers patented piston. A. Defendants' Exhibit 3-O is also a rather refined piston. It is, I believe, a piston for the Plymouth 1932, six-cylinder engine. This piston has a horizontal separation of the head section from the guide section on one thrust face. It also has a vertical slot connecting with the horizontal slot and combining with it in such a manner as to produce flexibility of the skirt section, especially at the top of the skirt where flexibility is most needed. The slot in Defendants' Exhibit 3-O does not extend to the bottom of the skirt. The skirt, however, is ground oval from the top to the bottom. The piston can be fitted so that the minimum clearance between the piston and cylinder is less than in a piston containing no slot. This is true at the top of the skirt because the combination of horizontal and vertical slotting permits some flexibility of the skirt and because the skirt is ground oval at the top, which permits of some distortion of the piston to compensate for excessive expansion, and also because the vertical slot is not completed, the portion of the top of the skirt immediately above the bosses becomes hotter than the portion adjacent the horizontal slot, and as a result of that the Mooers principle is brought into play to help change the piston from an oval shape to a round shape without exerting

pressure against the wall of a cylinder. That is the Mooers force tending to distort the piston is a force inside the piston itself, as a result of horizontal slotting and relief and differences in temperature between one part and another part of the piston. The Mooers principle would also apply at the bottom of the skirt to an extent as well. So that there is a force inside the piston itself tending to change the oval shape to a round shape without exerting extra pressure against the cylinder wall. Those are the reasons that I gave for saying that this piston is a rather refined piston. It is simple in its wall structure and rather complicated in its final finishing, in so far as the relations between horizontal and vertical slots and oval grinding are concerned. In so far as the top of the skirt is made flexible by this combination, this piston has the mode of operation at the top of the skirt of Gulick. In so far as the Mooers principle tends to change the oval shape to a circular shape, it has the mode of operation of Mooers. So that I should say the piston, although it embodies additional features over Gulick and over Mooers, it also embodies the Gulick features and the Mooers features.

Mr. Bruninga: Same reservation, your Honor.

The Master: Same ruling.

Mr. Richey: Direct examination closed.

Cross Examination by Mr. Bruninga.

Q. Is it your idea that the question whether a test is made for experimental purposes or for something going beyond experimental purposes, is a matter of the intention of the party who makes the test? A. Well, I wouldn't say that would be true entirely, at any rate. It might have some bearing on it. I don't know as there is an accurate definition of what is an experimental test and what is a test for further purposes. What one person would regard as still experimental, another one might regard as beyond the experimental stage.

Q. That is really an arbitrary matter, isn't it? A. To quite an extent it is.

Q. You also state that the length and duration of the test depended upon the change that has been made in the structure? A. Yes, that is one factor that has to be taken into consideration.

Q. In other words, if no substantial change has been made between one test and another, you would still consider that the first test has not been completed and

should be made over again in order to test out the particular structure? A. Well, I don't know exactly what you mean. Perhaps you can give me an example of what you mean.

Q. Well, if you take a piston having a certain construction and a test has been made for a certain period, and then a second test is made on another piston which don't differ in structure or mode of operation at all from the first one, would you still consider the second test an experimental test? A. Oh, it might be, yes. I would like to see the differences which you have in mind between the two structures.

Q. Well, in structures such like pistons that are changes in design and in thickness of material and strength of certain parts, or putting a web here, or putting another web there, those changes are made continually by motor manufacturers, aren't they? A. Well, that is pretty general. Some times a change which appears considerable can be put in without really changing much of anything; and another time a change which appears to be minor is the difference between success and failure.

Q. There is a difference in pure design and the development of a new construction that is generally recognized in the engineering art, isn't it? A. That is a change of an old design?

Q. There is a difference between a design of, say a piston having a certain construction or a certain diameter, or for another diameter, and a development of the new structure? A. Some times there is, although change in diameter is a very important change in certain applications to pistons.

Q. Well, take the Oakland piston, that is a small piston? A. Yes.

Q. And the Ford piston was a larger piston? A. Yes.

Q. Do you know which came first in the structure of the character of Exhibit 1? A. Yes, the piston more like the Ford piston; that is the Maxwell piston, which is more like the Ford, four-cylinder engine piston.

Q. Let's take Exhibit 1, the construction which you said simulated the Maynard patent; can you give me two pistons of different diameters that were used in cars around between 1922 and 1926? A. Yes, I think so. The Oakland as one and Maxwell another.

Q. They were of the same construction as far as simulating the Maynard patent was concerned, were they

not? A. Yes, generally, although the Oakland had the line F in Fig. 2 of Maynard vertical instead of at an angle as shown in the Maynard drawing; and the Maxwell piston, I think, had the line F pretty much as shown in Fig. 2 of the Maynard drawing.

Q. And the Oakland was the smaller diameter of the two? A. Yes.

Q. The Maxwell came out first? A. Yes; before the Oakland, as I recall it.

Q. Now, when the Oakland piston was designed, that is, put on the drawing-board, it was naturally necessary to change the dimensions all around? A. Yes.

Q. Even thickness of materials? A. Yes.

Q. And the piston was carefully tested by Oakland, was it not? A. Yes.

Q. The tests running over a considerable period? A. I don't know how long.

Q. But you rather believe that the piston was run over a considerable period? A. Yes.

Q. Now, what was the purpose of that test? A. To prove in the piston.

Q. Well, to prove whether or not the parts were dimensioned properly; isn't that right? A. Well, only in part. It was to prove whether the piston met all of the requirements demanded of a piston.

Q. But partly it was, at least for the Oakland engineers, to determine whether the design, that is, dimensioning of the parts, was correct in order to stand, have the piston stand up in the engine? A. Yes; not only to stand up, but to function without slapping or without sticking and without undue oil pumping.

Q. And that was an experimental test also, wasn't it? A. Oh, I think so, yes.

Q. What I am driving at, many experimental tests are carried out on pistons of the same construction but of different sizes? A. Yes, that is true.

Q. And one of those tests is to determine whether sufficient or too much clearance has been given to the piston? A. Yes.

Q. In other words, the clearance is not the same for all diameters? A. No, it is not.

Q. It doesn't even vary in the same proportion, does it? A. Not directly, no.

Q. Then the dimensioning of any piston requires its dimensioning and construction to be followed up by tests? A. Practically so, yes; it has been so in the piston art.

Q. And that included both block tests, that is where the engine is stationary, and road tests? A. That is correct.

Q. As a matter of fact, some of these road tests on engines containing a new piston, are performed for other purposes than to simply test out the piston? A. Some times a number of things will be under test at the same time.

Q. The road test is really to find out whether the car as a whole runs good? A. Some times.

Q. Well, after a trip, what do you do? A. The testing pretty generally in pistons may be divided into two main parts, I should say: the supplier of the piston may make up his mind that a piston of such and such design will be satisfactory. He may be thoroughly satisfied with it, but the motor car manufacturer is never satisfied with any test that the supplier may make; he makes his own tests and satisfies himself that the part is satisfactory. So in that sense, the road test made by the motor car manufacturer is usually made to prove in these various things to satisfy the motor manufacturer that the part is satisfactory for the standard equipment in his car.

Q. And after a long road test, the car is brought back into the shop and various parts of it carefully examined? A. That is correct.

Q. And even if there is a new piston put in the car, that examination is not limited to the examination of the piston? A. No, not as a rule.

Q. Do you know how pistons for stationary engines are tested? A. Well, yes.

Q. They are given a stationary test? A. Yes, they are.

Q. They don't take that stationary engine and mount it on a truck and run it all over the country, do they? A. No.

Q. You continually referred to pistons for pleasure cars. Do you find anything in these patents that specifically restricts the subject-matter to pistons for pleasure cars? A. No.

Q. The patents are for pistons, aren't they? A. Yes.

Q. And they might be for pistons for tractors? A. Yes, sir.

Q. For trucks? A. Yes.

Q. For stationary engines? A. Yes.

Q. Even for air compressors? A. Yes, they might be, but some of those are pistons for internal combustion

engines; of course those couldn't be usable in air compressors.

Q. Well, they can be used in air compressors, can't they? A. They might be; I don't know; but the problem that is met in the air compressor is different than the one that is met in the internal combustion engine.

Q. Well, assuming that to be true, what we have before the court here is a piston, haven't we? A. Yes, pretty generally.

Q. Now, going back to 1914 when the test of the Gulick aluminum piston was said to have been made, at that time permanent mold castings had not come into use? A. Permanent mold castings for pistons?

Q. Permanent mold casting of aluminum pistons? A. No.

Q. And any aluminum pistons in use at that time were sand cast pistons, were they not? A. Supposed to be.

Q. Well, you are pretty sure that they were sand cast pistons? A. Yes, I am.

Q. Now, a man might be satisfied with something less exacting in a sand cast aluminum piston than in a permanent mold aluminum piston; isn't that right? A. He probably would have to be if he were satisfied at all.

Q. In other words, a piston that showed up well after say a certain number of thousand miles, alumium piston in 1914, might be considered satisfactory, while in 1920 it might not be considered satisfactory? A. That is possible.

Q. You would expect more of an aluminum piston after 1915, wouldn't you? A. Yes.

Q. That is after permanent mold practice came into use? A. Yes.

Q. You heard Mr. Gulick testify, didn't you? A. The latter part of his testimony, yes.

Q. Well, in your opinion a sand cast piston that stood up for 4500 miles was a very good piston, was it not? A. Well, I think that depends a good deal on the conditions of testing, the conditions of running. If the piston had little or nothing wrong with it after that test, I should say it was doing very well.

Q. You don't think that piston was too brittle, do you, being sand cast? A. I don't know anything about it.

Q. Well, from your experience in permanent mold casting, would you expect a sand cast piston, a split sand cast piston of the structure described in this Gulick, as

Exhibit 51, to stand up for 4500 miles? A. Well, it depends entirely on the casting, the construction, the clearance allowed, and how well the piston was lubricated during operation, how hard it was run—there are a lot of factors that have to be taken into consideration.

Q. Well, you were familiar with all the factors, that he ran as much as 60 miles per hour; that he had a clearance so small that he actually pushed the pistons into the cylinders, in your opinion did that piston stand up for 4500 miles, being a sand cast piston? A. Well, I know nothing about it.

Q. Well, I know, but as an engineer what is your opinion?

Mr. Richey: I don't think his opinion is any good. We have had fast testimony on it, and he is asking his opinion to a fact. I object to it as incompetent.

The Master: This is in cross examination. I think he may answer.

A. I think that if the piston had been well made and well designed and well fitted, that those are the results that should have been expected.

Q. In the Kant Skore, in the Sterling and in the United cases, you testified that it was practically essential to employ permanent mold castings where you had a split piston on account of the vibration of the walls of a split piston as it went up and down in the cylinder. You testified to that effect, didn't you? A. Yes. I didn't have 4500 miles or 5,000 miles life in mind, however; I had 30,000, 50,000 miles life in mind. Nor did I have merely six pistons in mind. These pistons are used by the millions, and the desire is that each one shall stand up.

Q. It is your present opinion, then, that the sand cast piston constructed like Exhibit 51 and split like Exhibit 51 and ribbed like Exhibit 51, and separated from the head like Exhibit 51, actually functioned in that engine? A. Well, now, you are asking me for a conclusion as to facts, which of course I am not in position to give. If you ask me a conclusion as to whether that could do so, I will say yes, it could.

Q. But you didn't hesitate at all to give your conclusion as to Monckmeier's piston, did you? A. No, I didn't. I have the Monckmeier piston before me.

Q. Well, Mr. Gulick described his piston pretty accurately, didn't he? A. Yes. I testified nothing as to

facts, however, as regards the Monckmeier piston, that is, as to what Monckmeier did or what he did not do. I had no way of knowing those things.

Q. But you guess pretty well of what he didn't do? A. Yes, I analyzed, from the structures before us, as to what he must have done or what he must not have done in certain respects.

Q. But do you want to say whether in your opinion the Gulick piston probably worked for 4500 miles in 1914? A. Yes, I do.

Q. You say you really think it did? A. Well, I can't say as to whether I think it did or not because I think that is asking for a question of fact over which I have no way of knowing. I will say, however, that in my opinion Mr. Gulick's description of the piston and his results are entirely in accord with what might have been expected.

Q. And you don't think that piston was too soft, then, to operate satisfactorily? A. I think it very likely may have been too soft to operate satisfactorily, especially as regards battering out of the ring grooves, which is usually the first thing to happen to a sand cast aluminum alloy piston, and even that does not usually come inside of 5,000 miles. I have run sand cast aluminum alloy pistons myself more than 10,000 miles.

Q. You didn't tell the Court in those other cases that, did you? A. No, I didn't. I would have, however, if I had been asked. I told the Court about the battering out of these rings in the sand cast piston, and of course that is a fact they do, and if the Gulick 1914 piston had been run long enough that difficulty probably would have shown up.

Q. But that was a matter of metal, wasn't it? A. That was a matter of metal to a large extent, yes.

Q. In other words, 5,000 miles, which is 500 more than Gulick figured out he ran, and those defects would have shown up? A. No, not necessarily, but there was no evidence as to whether the ring grooves had battered out or whether they hadn't, as I understand the evidence on the Gulick 1914 piston.

Q. Well, you think Gulick would have said that the ring grooves had battered out, if they had actually battered out, wouldn't you? A. He might not even have noticed it.

Q. Even after careful examination? A. Yes, that is true.

Q. You don't think the piston was too brittle? A. I don't know anything about it.

Q. Well, being a sand cast piston and being before the age of permanent molding, which according to your previous testimony in the other case, put the aluminum piston on the map, what have you to say?

Mr. Richey: I object to that, interpreting the witness' testimony without confronting him with it.

Mr. Bruninga: He is at liberty to say whether he testified like that.

The Master: He may answer. If he wants to get what he said before, let him get it and see, but I think it is proper cross examination.

A. (After question is read) It may well have been too brittle for long life, or if not too brittle it may have been too soft for long life.

Q. Being a sand cast piston, it would naturally show up some scoring on account of inclusion of sand? A. Oh, no.

Q. You don't think so? A. No.

Q. That didn't happen in the sand cast piston? A. No, the sand that sticks to the surfaces is all machined away.

Q. It is not in the cavities, in any possible cavities in the aluminum piston? A. No, anything of that sort would show up on the machining of the piston.

Q. You have stated on direct examination you have read Mr. Gulick's testimony, particularly about the tests that he made? A. No, I didn't say that I read his testimony, as I recall it. I heard him describe his tests. I read none of Mr. Gulick's testimony.

Q. You heard all of his testimony as to the tests that he made? A. Well, I don't know whether that was all of his testimony regarding the tests or not. I heard him give testimony regarding his tests. To be more exact, I did not hear any of Mr. Gulick's testimony prior to the 14th of March, and I think I heard all of his testimony from the 14th of March until its conclusion.

Q. Now, going to the Schoengarth piston, that piston really had a T-slot in the skirt? A. Not in the ordinary sense that we speak of a T-slot.

Q. How much inclination do you have to give the vertical stroke in order not to be a T-slot? A. I don't know as I could state what inclination the vertical slot should be given, but the lower end of the T in Schoengarth is directly below the center of the boss, and the

location of a slot in that position is such as to make the thrust face at the bottom of the skirt very flexible, that is, the whole of the thrust becomes available to close the slot; whereas if the lower end of the slot is in one of the thrust faces instead of at right angles to the center of the two thrust faces, the explosion force, or the other thrust force, is not so potent in causing collapse or closing of the slot itself.

Q. You see a wide distinction between the T-slot of the Schoengarth patent and Exhibit 48, leaving out of consideration for a minute the adjustments of the Schoengarth patent? A. I don't know whether to call it a "wide" or not, but there is a very marked difference. In the Exhibit 48 the vertical slot begins not in the center of the thrust face at the top of the skirt but off to one side from the center of the thrust face, and then goes diagonally toward the bottom of the skirt and intersects the bottom of the skirt at some distance from a line drawn between the center of the boss vertically to the bottom of the skirt. The Exhibit 48 slot therefore has a tendency to utilize only a portion of the thrust force to close the slot, whereas the slot of Schoengarth can utilize the entire thrust force to close the slot.

Q. You think Exhibit 1 is more like Exhibit 48, or more like the Schoengarth patent, disregarding for a moment the adjustment, considering only the slotting? A. In one sense it is more like Exhibit 1, because the center of the vertical slot in Exhibit 48 is in the center of the thrust face, and the center of the vertical slot in Exhibit 1 is in the center of the thrust face; whereas in Schoengarth the center of the vertical slot is way over to one side of the center of the thrust face. On the other hand, the angularity of Exhibit 48 slot is more like the Schoengarth slot than it is the Exhibit 1 slot.

Q. But Schoengarth's vertically extending slot starts from about the center of the horizontal slot, as in Exhibit 1, while in Exhibit 48 it starts, the vertical slot, starts from nearer one end of the horizontal slot? A. That is correct.

Q. In that respect Exhibit 1 is more like the Schoengarth patent? A. With respect to the top of the vertical slot, that is true.

Q. Well, leaving out the adjustments of the Schoengarth patent, the skirt will contract and expand, will it not? A. The bottom of the skirt will, if the sections of the metal of the piston are made proper, but the top

of the skirt, that is the portion of the guide section above the horizontal slot, will not.

Q. You mean the part above the slot 3 in Fig. 2? A. That is correct.

Q. That of course will not expand? A. That is not flexible, no.

Q. That is not flexible. And that part in Exhibit 48 is also not flexible, is it? A. No, it is not.

Q. According to Mr. Gulick it is just made smaller in diameter? A. Yes, or according to Mr. Gulick that horizontal slot in Exhibit 48 or in, rather, pistons of which 48 would be considered to be a rough example, the horizontal slot divided the head section from the guide section.

Q. You don't actually find that in Exhibit 48, do you? A. I haven't measured it.

Q. Well, you can measure it right now and settle it. A. (After witness measures same.) No.

Q. What did you find the diameter of the part above the slot, the horizontal slot, along the line of the wrist pin bosses, to be? A. 4.121" approximately.

Q. And the same diameter at right angles to it? A. Yes, approximately.

Q. What is the diameter of the top ring land? A. 4.118", approximately.

Q. In other words, that piston don't represent accurately what Mr. Gulick said the 1914 piston construction was? A. 1914?

Q. 1911. A. No, it does not.

Q. That happens in patent drawings, too, doesn't it, that patent drawings don't show the actual dimensions? A. Very often they do not.

Q. Well, most of the time they don't? A. Oh, most of the time they do not show actual dimensions, no.

Q. And even when an ellipse or an oval is supposed to be shown on the drawing, having a very slight difference between the major and minor axis, the draftsman usually takes a compass and draws a circle, doesn't he? A. I think he is apt to, yes.

Q. Now, going back to a comparison of the Schoengarth patent and Exhibit 48, the bottom of the skirt is very, very flexible, is it not, of Exhibit 48? A. Yes, it is.

Q. And that is one of the faults you found with the Schoengarth patent construction, leaving out the adjustments? A. Oh, I don't find that particularly as a fault with the Schoengarth patent, leaving out the locking

rings, I merely call attention to it as having no useful function.

Q. But you do find that a fault with the Kant Skore piston, Exhibit 3-Z, didn't you? A. Yes, that is a fault in the Spillman type piston.

Q. Do you know why Mr. Schoengarth in his patent carried the slot 4 around so far, that is, can you tell from the patent itself, or do you remember whether the patent states why he did? A. I don't remember.

Q. Well, I want to read to you a sentence from the patent, page 1, lines 53, *et seq.*: "This slot is cut diagonally for two purposes, first, to prevent scarring, and, second, for convenience in making the upper and lower piston adjustments." The first purpose of preventing a scar, that is common with practically every piston, to incline the slot, for instance as in Exhibit 1? A. That is the usual practice, yes.

Q. In other words, if you have it vertical, why, people believe that there will be a groove worn in the cylinder? A. That is the reason, I think, for the making of the slot slightly diagonal.

Q. Now, the second reason, for convenience in making the upper and lower piston adjustments, can you tell me what would have happened if Mr. Schoengarth had located his adjustments right down below the middle of the horizontal slot, that is, in one of the thrust faces? A. Yes, I think so. I think the adjusting means would have interfered with the connecting rod in the stroke.

Q. But of course if he shifted it around, the lower adjustment particularly, if he shifted it around, it would not interfere with the connecting rod? A. That is correct.

Q. At the top he could leave it in the center, couldn't he? A. Yes.

Q. Mr. Schoengarth used somewhat inwardly projecting adjusting parts which required him to shift the lower adjustments around at right angles from where he could have put it if the connecting rod had not been there? A. That is true. The location even at the top of the skirt is placed in the thrust face so that the locking and adjusting means will not interfere with the bosses. So that everything in the Schoengarth construction is designed to be used with those locking means.

Q. Well, he uses those locking means and he inclines his vertically extending slot to the limit in order to locate his lower adjustment? A. That is correct, and also the upper adjustment.

Q. Well, so far as the upper adjustment is concerned, the vertical slot can start from the middle of the horizontal slot? A. Yes, or it could start from the bosses; it could start from any place. The location of it in the thrust face is merely incidental, as I see it, to the freedom from interference with the bosses themselves.

Q. Well, the required freedom of interference with the connecting rod required the slot to be on that long slant? A. Yes, that is the only reason that the vertical slot is placed as it is, and consequently the horizontal slot is placed as it is, as I see it.

Q. You have said that the piston was more rigid than a non-slotted piston. Did you mean by that that the structure itself with the slot in it and with the two screws in it, would be more rigid than if there would be no slotting of the piston at all? A. I think so, yes, more rigid against distorting to an out-of-round shape, for example, to accommodate itself to a cylinder that might be slightly oval.

Q. Well, that is what the adjustment was for, wasn't it, to adjust it to a cylinder that was oval? A. No, I think the adjustment was to merely take up the extensive clearance that had resulted from wear.

Q. Where did the wear take place in an engine cylinder—all around? A. Well, yes, it takes place to some extent, but by far the greater part of it is usually on the thrust faces.

Q. And that adjustment would take up for that wear? A. I don't know, I suppose it would.

Q. The piston itself, without the slotting or without the adjustment as shown in the Schoengarth patent, is the Ford piston of that day, isn't it? A. I don't know.

Q. You are not familiar with it? A. No.

Q. One of your objections to the Schoengarth patent was that there was no relief in the region of the wrist pin boss. That is a serious objection in your opinion, is it? A. Well, I mentioned that as one of the features of the construction as shown. There is not any relief shown around the bosses, and, particularly, no relief to work in combination with the slotting, as in the patents in suit.

Q. Now, Doctor, you have read a good many piston patents? A. Yes.

Q. You would be almost safe in saying you have read almost all the piston patents, haven't you, that issued in this country? A. No, no, not nearly all. I un-

derstand there are over 2,000 of them, and I don't suppose I have read more than 75 or 100.

Q. Do you remember whether each one of the piston patents that you have read has specifically stated that the piston should be relieved in the region of the wrist pin bosses? A. Well, if the relief is to function in combination with something else in the piston of an unusual nature, it certainly should be mentioned and described.

Q. Will you please answer my question after you have given your reasons for why it should be? A. I think your question is so general that it is practically impossible to give it a proper answer.

Q. Will the reporter please read the question to the witness? A. (After reporter reads question to witness) I am sure that each one has not.

Q. It is universal also to reduce the diameter of the piston where the ring lands are? A. Yes, it is.

Q. That has been the practice as long as you can remember, isn't that right? A. Not necessarily the whole of the ring lands, but the head of the piston in some place is separated from the skirt by head clearance, and that has been the practice as long as I know anything about it. Of course that does not follow that that extra clearance is necessarily given around each one of the rings.

Q. But it has been the practice for as long as you remember to make the head of smaller diameter than the skirt? A. Yes.

Q. And in the patents that you have read that proposition has not been repeated each time, has it? A. No, I think not always.

Q. Well, if it was repeated it shows the patent solicitor didn't know the state of the art? A. No, it wouldn't indicate that at all. In some of these constructions it becomes quite important just where this head relief and where the guide section begins, and I think it is important to note that in places where that separation has more than the ordinary significance.

Q. Well, it is so important that no piston has been made for the last 20 years in which the head wasn't larger than the skirt? A. You mean the head smaller than the skirt?

Q. The head smaller than the skirt? A. Not that I know of.

Q. Now, you wouldn't expect a patent to repeat a universally well known feature of a piston, would you? A. If it is important I would.

Q. But otherwise not? A. If it has no bearing on the patent, I don't see any reason for repeating it.

Q. Well, if you read a description of a piston and nothing was said about the head being smaller than the skirt, wouldn't you read it right into that patent? A. Oh, I think I would, if it is an ordinary piston.

Q. What would happen in a piston like the Schoengarth patent if the diameter of the part above the slot 3 was of larger diameter than the cylinder? A. Was of larger diameter than the cylinder?

Q. Yes. A. Well, if it were larger than the cylinder you couldn't get the piston in.

Q. And what would you do if you had such a piston? A. Oh, I would fix it so I could get the piston in the cylinder, certainly.

Q. And you would turn it down, wouldn't you? A. I would know that the fit was wrong and I would try to fit it properly.

Q. And you would allow clearance at that point, wouldn't you? A. Yes, I would allow clearance but how much clearance I don't know at the moment.

Q. Well, you would be safe in allowing head clearance, wouldn't you? A. Yes.

Q. And that is the only thing to do in a construction like Schoengarth, is to apply the head clearance to the lower ring land, that is the part below the lowest ring groove? A. No, that is not the ring land, that is part of the skirt in Schoengarth.

Q. All right, now, I say the part below the lowest ring groove? A. No, that is not the only thing to do, at least it wasn't back in 1915 and '16 at the time of Schoengarth. The natural thing to do was to make the whole skirt section the same diameter unless otherwise stated, and the division between the head and the skirt of that piston would certainly not be lower than the bottom ring groove; it might be higher but it certainly would not be lower.

Q. You would think, then, that any engineer that read the Schoengarth patent would deliberately fail to leave clearance sufficient to prevent seizing of the part below the lowest ring groove and above the slot 3? A. No, he would provide clearance of the whole skirt sufficient to prevent seizing, including the slotted portion and the portion above the slot.

Q. Even if he wanted to expand it? A. He wouldn't expand it until he got enough wear to take up. In fitting that piston, as I see it, it would be fitted

just like a trunk type piston at the outset. Then, later, after the skirt had been worn, this adjustment would be applied and the whole of that skirt would start out with the same clearance.

Q. And when you got through adjusting that piston you would have a piston structure in which the skirt is of larger diameter than the part above the slot 3, isn't that right? A. Not necessarily. It wouldn't do any good to be of larger diameter.

Q. Even if you would expand it? A. Well, if the piston were fitted right in the first place, you would have just as much wear on the portion below the slot as you would above the slot, or approximately the same amount.

Q. But please answer this question now: assuming that piston to be of uniform diameter from the bottom of the skirt to the lowest ring groove, and you would then expand that skirt, you would then have the skirt at right angles to the wrist pin bosses of larger diameter than the part above the slot 3? A. Yes, if you expand it with the expanders, then it becomes larger in that other part.

Q. Or if you spring it, that would happen? A. If it is sprung outward, yes.

Q. And you can spring cast iron for a few thousandths of an inch, can't you? A. Oh, you can't spring it there without the help of the slots; you couldn't spring the part just below the part 3 without also springing the part just above part 3.

Q. If you had the slots in it you couldn't spring the skirt out? A. No, I say without the slots you couldn't do that.

Q. With the slots? A. With the slots, the part below 3 could be sprung out a little farther than the part above 3; but there would be no flexible skirt structure under those conditions, the skirt would be rigid.

Q. Doctor, it was the general practice when you started to go into this piston business, learned the piston business, to have the diameter of the skirt below the lowest ring groove smaller than the skirt itself, wasn't it? A. No.

Q. I am referring to the Howe patent. I call your attention to Howe patent 968,569. You know, don't you, that automobile manufacturers paid royalties on that patent? A. No, I know nothing about it.

Q. You don't know anything then about the practice then of using that Howe construction in pistons way back as early as 1915 or '16 or '17? A. No.

Q. You weren't familiar with that? A. No.

Q. That is the feature that is shown in the Maynard patent, isn't it, in Fig. 2 at J, reducing the diameter of the head in that case? A. Yes, that is somewhat similar, at any rate.

Q. Well, anyone reading the Schoengarth patent as early as 1917, he would naturally read into it that that piston had to be relieved in the region of the wrist pin bosses? A. No, I think not.

Q. You mean to say it was the general practice then in '15, '16 or '17 not to relieve pistons in the region of the wrist pin bosses? A. No, I wouldn't say that, either.

Q. You don't know, do you? A. Yes; sometimes they were relieved and sometimes they weren't.

Q. What happened if they were relieved? A. They needed a little more clearance in fitting.

Q. As an alternative of clearance, relief was provided in the region of the wrist pin bosses? A. Yes, if reliefs were present that made it possible to use a little less clearance.

Q. Then you have the alternative of using a relief, for instance as in the Kaut Skore piston 3-Z, or of using an oval piston with the smallest or minor axis on the line of the wrist pin bosses? A. Well, I don't know what one might have done with that Schoengarth piston at that time.

Q. I am talking about pistons generally, I am not limiting myself to the Schoengarth. I am just using those two types of relieving the oval structure with the smaller or minor axis along the line of the wrist pin bosses, or an actual cut in or cast in relief? A. Well, one might use neither.

Q. Those were two expedients that were interchangeably used as early as 1917? A. In solid type pistons, I should say, yes.

Q. And anyone reading the Schoengarth patent in 1917, one skilled in the art, in this particular piston art, would know of the use of those two or three alternative constructions of securing relief? A. He might, yes.

Q. Why do you say he might, if he was one skilled in the art? A. Well, for all one could tell from the Schoengarth patent, this adjustment might do all the things that would be necessary for the proper operation of the piston.

Q. Well, if you found out that it didn't, would he naturally put in a relief? A. Oh, naturally a person would try to get the best result he could.

Q. You know, don't you, that anyone reading piston patents in 1916 or '17, and starting to design a piston, he would naturally put on reliefs in the region of the wrist pin bosses? A. No, I don't say that he would naturally do that.

Q. Well, unless he used a construction such as the Gulick patent structure or the Spillman & Mooers? A. Why, no, people used trunk type pistons without relief around the bosses.

Q. Were they skilled engineers? A. Yes.

Q. Well, do you consider that proper practice? A. I thought it was, supposed to be pretty fair. Packard used it in their 12-cylinder cars. They used the trunk type aluminum piston without relief around the bosses.

Q. And how long did the Packard 12-cylinder motor stay on the market? A. Oh, about three or four years, maybe longer.

Q. You have talked with the man that owned one, haven't you? A. Yes. I have ridden in them. I have ridden around the Indianapolis Speedway with Col. Vincent in one.

(Thereupon, adjournment was taken to the following day.)

(At 9:30 a. m., Tuesday, March 21, 1933, the hearing was resumed.)

Q. Dr. Jeffries, one of the distinctions that you stressed of the Mooers patent in suit over the Schoengarth patent is that the Schoengarth patent does not describe any relief in the region of the wrist pin bosses. A. That is one of the things, yes. The other is that Schoengarth does not have the horizontal separation between the head section and the guide section.

Q. Well, you don't think it makes any distinction that that Schoengarth slot only extends around a little less than 180° rather than almost all the way around, as in Mooers? A. Why, the principle would work in that way, if relief were combined with such a slot, provided the slot were properly located.

Q. Properly located. What you mean is that the part of the piston above the slot should be reduced in diameter to, oh, approximately what the head diameter on the ring land was? A. Yes, or at least have sufficient relief.

Q. Of course, when you talk about the Gulick 1911 piston and when you make your distinctions over Schoengarth and various other patents, you assume that that

piston, that 1911 piston like Exhibit 48, actually had the part above the slot reduced in diameter? A. Yes, I assume that, and I also assume that the skirt was made to flex in the motor, not merely be there to enable some one to lock the skirt into some definite position, like Schoengarth.

Q. Do you make that definite assumption because you heard or read of Gulick testifying to the effect that the 1911 piston like Exhibit 48 had the diameter reduced above the horizontal slot? A. That is correct.

Q. And if that weren't true, would your opinion be the same? A. No, if that weren't true I would say that the Gulick 1911 piston did not embody these inventions.

Q. In other words, in order for the Gulick 1911 piston to embody any of the patents in suit, it is essential that the diameter of the part above the horizontal slot approach the diameter of the ring lands which are usually of the standard clearance? A. Not necessarily that far, but the diameter should be less above the horizontal slot than it is below the horizontal slot.

Q. How much, roughly, would you say it would have to be on a 4" piston? A. Well, on a cast iron piston it probably wouldn't have to be more than a couple of thousandths of an inch less to make the slotting operable; but on an aluminum piston it should be more. I would say, functionally, that the diameter of the portion above the slot should be reduced enough so that it would not seize when the piston operated in the motor. Then it could be reduced considerably more than that without hurting the operation, and it might even help the operation some; but that is the distinction.

Q. What would you say for a 4" piston like Exhibit 48 with a clearance only as little as two thousandths of an inch—I don't mean per inch diameter now, but for that particular piston? I just want to get a general idea. A. Oh, in a cast iron piston, if that difference in diameter were two or three thousandths of an inch, that would be some help, yes, it might be sufficient.

Q. But five or six thousandths would not hurt? A. Oh, that wouldn't hurt, no.

Q. Now, in distinguishing between the Gulick 1911 piston and the Schoengarth patent piston, you stated that although the 1911 piston like Exhibit 48 had no relief in the region of the wrist pin bosses, it would work all right, to a degree, with cast iron? A. Yes, that is my opinion.

Q. That, of course, assumed that the diameter of the part above the horizontal slot provided for clearance? A. Yes.

Q. What have you to say about aluminum as to such a piston? I notice you said it would work, to a degree, with the cast iron. A. Yes, it would not provide so much help in the aluminum piston.

Q. In other words, in the aluminum piston it is necessary to relieve the outside of the skirt in the region of the wrist pin bosses? A. Either that or put the slot around the other side and make the metal connection between the head and the skirt very much less than it would be in the Gulick 1911 piston with the horizontal slot on one side only.

Q. You mean it is necessary to put a horizontal slot on each side, like in the 1914 piston? A. Yes, to get much help, to get enough help to make an aluminum piston function materially better.

Q. Do you think it made any difference whether the slots went all the way around in the 1914 piston or only stopped in the region of the wrist pin bosses? A. Yes, the slot going all the way around made a less rigid construction between the head and the skirt portion, and would make possible some distortion of the skirt in response to the cylinder wall pressure.

Q. Do you think it would have worked all right if the horizontal slot hadn't gone all the way around? A. Not so well.

Q. But you think it would work all right? A. It would have functioned to an extent, yes.

Q. The reason I am asking that is that one of the witnesses who was examined on behalf of Gulick said that in that 1914 piston the slot did not extend all the way around, but was more like Exhibit CCC in that respect. It is your opinion that the Gulick piston, even if the slot only extended part way around, worked all right? A. Well, I wouldn't say it worked all right; but it is my opinion that it would function to an extent. It would not be as good as the one in which the slot extended all the way around.

Q. Would an ordinary skilled mechanic make the diameter of the ring lands, the parts between the grooves, so near the diameter of the cylinder as to leave only, say, two-thousandths clearance? A. Between the ring grooves and the cylinder?

Q. Between the ring lands and the cylinder? A. No, I shouldn't think so.

Q. In other words, from as long as you have been connected with pistons, the operation of pistons, it has been the practice to give considerable clearance to the head part of the cylinder containing the ring lands? A. Yes, it has.

Q. And it has also been the practice to taper the skirt from the bottom of the land ring groove to the end? A. That is an unusual practice.

Q. Was it an unusual practice? A. Yes.

Q. But it was practiced? A. It was done, yes.

Q. And that made the skirt at the top smaller in diameter than the skirt at the bottom? A. Yes.

Q. There was a usual and standard taper in pistons, wasn't there? A. Nothing standard, I think, about it.

Q. But the idea was to take care of the difference in expansion as between the skirt at the bottom and as between the skirt at the top? A. That is right.

Q. In discussing the Gulick 1914 piston, Exhibit 51, I see you state that the construction was such as to permit distortion. Can you explain that? A. Yes.

Q. Is it possible for you to use Exhibit 51 to describe that? A. I showed yesterday in connection with Exhibits 72A and 72B what a tremendous restraining effect the connection between the piston head portion and the guide portion made in the rigidity or flexibility of the skirt portion. The connection, for example, on a piston like Exhibit 1, makes even the bottom of the skirt, some two inches away from the connection, fifteen times as stiff as when the connection is severed. In the ordinary trunk type piston with the connection of the head and skirt around the entire periphery of the skirt, the rigid head section resists the deformation of the skirt section, especially near the junction between the head and the skirt sections. In the Gulick 1914 piston, Exhibit 51, the head section is separated from the guide section by two horizontal slots which make the separation of the head and the skirt, say 75 or 80 per cent complete. This relieves the restraining effect of the rigid head from its effect on the distortion of the skirt. The vertical slot in Exhibit 51 permits the skirt to distort where it can, the play being taken up in the slot. Where there is no slot or no relief there is no place for play to be taken up. So that the piston would fit tightly against the cylinder at every point of the circumference. Where there is relief alone there may be some place for the relieved part to move so that such a piston may be dis-

torted somewhat in the cylinder. The slot, in effect, takes the place of the relief inasmuch as it provides room for the other parts of the cylinder to move when the distortion forces are applied. Therefore in my opinion the 51 construction provides for some distortion of the skirt at the top of the skirt.

Q. You believe a piston like that without relief in the region of the wrist pin bosses operated successfully with a snug fit? A. Well, "a snug fit" is a relative term.

Q. Oh, I understand that. It means a fit that you simply push it in rather easily? A. Well, it means one thing to one person and another thing to another person. The difference between the proper fit and the improper fit may be unmeasurable with any instrument.

Q. A snug fit isn't one you simply drop a piston in a cylinder and let it run way to the bottom? A. Well, I never saw any piston that would fit that way. I never saw a piston but what looked like a snug fit to me.

Q. And that was several thousandths clearance? A. Yes, yes.

Q. Now, you understand of course that Exhibit 51, as Mr. Gulick said he used it in 1914, did not have the relief in the region of the wrist pin bosses? A. Yes, I understand that.

Q. And I suppose that is the distinction over the Mooers patent? A. That is correct. The Mooers principle could not work in the Gulick 1914 construction. The Mooers distortion comes from forces within the piston itself, not as a result of cylinder wall pressure.

Q. And Mooers provided relief in the region of the connection, and Mr. Gulick provided the slot; is that the difference? A. No.

Q. Between 51 and the Mooers patent? A. No. I just explained it. The Mooers provides a combination of horizontal slotting between the head section and the guide section, and relief at the connection between the head section and the guide section; so that the distortion forces arise within the piston itself due to the construction and the differences in temperature. Any distortion in the Gulick 1914 piston, Exhibit 51, would have to occur as a result of cylinder wall pressure against the piston, that is, external to the piston.

Q. The Gulick piston, Exhibit 51, would work better if it had relief in the region of the wrist pin bosses? A. No doubt about it.

Q. No doubt about it at all? A. No.

Q. And that relief, the prior art shows, was the quite usual practice at that time? A. Not in combination with flexibility and not properly positioned to cause that benefit.

Q. Now, coming to the Monckmeier cast iron piston, Exhibit 3-V, that piston had plenty of wear in it? A. Yes, it had.

Q. In fact, taking the diameter just below the slot, the diameter along the line of the wrist pin bosses, is about seven thousandths greater than at right angles; isn't that right, from your figures? A. Yes.

Q. Well, that was due to wear, wasn't it? A. I think so, yes.

Q. You don't think for one minute it was turned oval like that? A. No.

Q. In fact, if it was turned on a lathe or grinder it must have been turned around; isn't that right? A. Yes, ordinarily.

Q. If that piston had twenty-thousandths clearance, then the wear on the diameter of the wrist pin axis was about two thousandths? A. Yes.

Q. Very little wear on the wrist pin axis? A. That is true.

Q. Now, you would expect wear in a racing car such as Mr. Monckmeier described, wouldn't you? A. Yes.

Q. You would expect lots of it, wouldn't you? A. I should think so.

Q. The purpose of these racers is to win the race even if they do damage their car some? A. Yes.

Q. In fact you find that wear on the head also, don't you? A. I find the wear on certain of these ring lands. There is no wear on the head.

Q. Well, I mean the ring lands on the head. They were worn? A. The ring lands, some of them were badly worn, showing that they had been bearing against the cylinder wall.

Q. Will you again take 3-V and take micrometer measurements across the top ring land at right angles to the axis of the wrist pin bosses? A. (Witness complies.) 4.457".

Q. Will you correct that on Exhibit 74? A. Yes, that was a mistake of ten thousandths of an inch.

Q. Just correct it. Cross out the figure on the exhibit and put in the other figure. A. (Witness complies.)

Q. It is your idea that the slotting never came into play in that piston? A. For any use, yes, for any good

use. Of course, if a piston were run with the slots in, the bottom of the skirt would have flexed, but it would not have done any good.

Q. But as far as the top of the skirt part below the horizontal slots, there was really no bearing on them at all, was there; that is, as distinct from the part above it, as you see it? A. Not to any appreciable extent at any rate.

Q. But, Doctor, you say later on if that piston had been in use, this connection should have been broken. How do you explain that? A. Well, I said it may have been broken. I didn't say it would have been broken.

Q. That is what you meant, it might have been broken? A. Yes.

Q. But not necessarily would have been broken? A. I wouldn't say it would. I would expect it to have been, however.

Q. It would be sufficient to have a T-slot on one side, if it did function properly; it wasn't necessary to have the T-slots on both sides function? A. Not if one of them did some good, the other one could be out of commission. But neither of these will do any good.

Q. That is your opinion? A. That is my opinion.

Q. You have never seen any Staver automobile, have you? A. No.

Q. You have never seen the Teeter engine of that date, have you? A. No.

Q. You don't know what kind of oiling system they had? A. No.

Q. You don't know the condition of the cylinders of those motors, do you? A. No.

Q. Do you think it made any difference whether there were slots on both sides or only on one side? A. Yes.

Q. You think it would have functioned better if it functioned at all, if the slots had only been on one side? A. No, I think it would function poorer with the slots on one side, and still poorer with the slots on both sides.

Q. It was the practice as early as you can remember to give so much clearance per inch diameter to a piston? A. No, not necessarily. Each car and each condition had to have the clearance varied to suit such car and such condition.

Q. It is your opinion, then, that the required clearance don't increase with the diameter of the piston? A. Yes, it does usually increase with the diameter of the piston but it does not increase necessarily the same amount per inch of diameter of the piston.

Q. Then with a 4½" piston you would need more clearance than with a 3" piston? A. Yes, if they are the same kind of a piston.

Q. In this Monchmeier piston circumferential expansion took place in that skirt, didn't it, run under very extreme conditions? A. Well, what do you mean by "circumferential expansion"?

Q. Well, the skirt expanded circumferentially, say at the bottom, as it became heated up? A. Yes, except that is all referred to in terms of the expansion of the diameter.

Q. One of your objections to the Monchmeier cast iron piston is, again, it has no relief in the region of the wrist pin bosses? A. Yes, it has no relief, in combination with the horizontal and vertical slotting, the horizontal slot separating the head section from the skirt section.

Q. That is one way that you distinguish it from the Moseley patent, isn't that right? A. Yes.

Q. And as far as the Schmidt-Hackbart patent is concerned, you did not consider the big holes in the Monchmeier piston as having anything to do with the holes in the Schmidt-Hackbart patent skirt? A. No.

Q. Now, as for the slot, on both sides or on one side, that is one distinction as between Jardine and Monchmeier, is it? A. Not in itself.

Q. Do you find any carbon deposits on the outside of the skirt of S-V? A. Yes.

Q. Where do you find them? A. All around one of the bosses.

Mr. Bishop: The one that is chipped on the side.

Q. Where else? A. In the oil groove, near the bottom of the skirt, on both thrust faces and below the chipped boss, oh, practically all the way around.

Q. And that was picked up by those grooves, wasn't it? A. I presume so.

Q. Picked up from the walls of the cylinder? A. I presume so.

Q. Do you find any carbon deposits on the faces themselves of the skirt outside of the region of the wrist pin bosses, due to any blow-by? A. It is quite difficult to say, the piston is so rusty, but I think there is evidence of carbon deposit in many parts of the skirt. For example, at the bottom of the skirt where the vertical slot has not been completed, there is a fairly large area

that looks like carbon deposit that has been cleaned off or at least an attempt has been made to clean it off.

Q. You don't find any carbon deposit in the horizontal slot opposite the one in which the vertical slot has not been completed? A. I find no carbon deposit in any of the slots. In fact, the little oil groove just below the bottom ring has carbon deposit in it in the region of the cracked, broken boss, and the carbon deposit stops abruptly where the horizontal slot begins.

Q. But in that top groove, the top groove picked up the deposit by rubbing back and forth in the cylinder and consolidated it in there? A. Well, I don't know.

Q. Well, that is a natural thing that happens in a piston of that kind? A. That is one way, yes.

Q. And with a splash system, or any system of lubrication as far as the vertical slots are concerned, there is oil splashing in those all the time, as far as the vertical and horizontal slots are concerned, there is oil splashing in those during all the time of the operation of the engine? A. There should be.

Q. Now, the aluminum piston, Exhibit 3-W, it is rather unsafe to take any measurements of that after its apparent condition of having been in a fire? A. Well, I think not. There are some measurements on it that are, I think, quite significant.

Q. Again, there has been considerable wear on that aluminum piston, hasn't there? A. Yes, I think so.

Q. The wear that has been on the thrust faces has been in the neighborhood of at least .003 of an inch? A. Yes, the measurements I have here would indicate .009 of an inch.

Q. The skirt is of the same diameter all the way through as from the measurement which you have taken? A. Yes, as nearly as I can measure it, that is on the boss axis. So much of the skirt is broken away on the other axis that no measurements can be made at or below the bosses.

Q. That is a sand cast piston, is it not, 3-W? A. Yes.

Q. You would expect it to be soft, wouldn't you? A. Well—

Q. As compared with the permanent mold cast piston? A. I would expect so, yes. I can tell in a moment. (Witness hits pistons together.) I have just knocked Exhibit 72-A, which is the head section of a permanent mold casting, against the head section of Exhibit 3-W,

and the Exhibit 3-W exhibits a considerable dent, whereas Exhibit 72 is hardly affected.

Q. As a matter of fact the skirt in that aluminum piston has a taper of .001 of an inch, hasn't it, from the top to the bottom? A. Well, according to my measurements they were the same, 4.47".

Q. I believe you gave the figure of the top of the skirt below the slot as 4.472 and at the bottom 4.473? A. Well, I took these figures from Mr. Gabriel's shorthand record yesterday and I can re-measure it.

Q. Re-measure those two. A. (Witness complies.) I find them both the same, 4.473".

Q. Mr. Monckmeier could not have obtained a die-cast piston or a permanent mold piston in 1915, could he, the early part of 1915? A. Well, I imagine he could after the very late winter of 1915.

Q. But not in the forepart of 1915? A. No, I think not.

Q. And that sand cast aluminum piston was about the best he could get, I don't mean as far as comparison of two sand cast pistons was concerned, but he couldn't have gotten anything else better in the aluminum piston in the early part of 1915? A. It would have been fairly soft, if he had the required toughness in it, yes.

Q. Has there been distortion in that piston due to heat, assuming it has been through a fire? A. I don't know.

Q. Well, you could tell from your measurements whether there is much distortion, couldn't you? A. It doesn't appear to be distorted, at least across the boss axis.

Q. Have you measured the temperatures of any pistons of any racing cars at the skirt? A. No.

Q. Do you know whether as a matter of fact they never do reach the temperature of 450 Fahrenheit? A. Oh, I should think they did. The figure I used in connection with this aluminum piston was 450 degrees above the temperature of the cylinder wall. And then I only took .025 of an inch as the clearance, and the indication here is that it would be at least .027 of an inch, and that would be on the presumption that the piston operated in the cylinder of just 4½" in diameter; so if the cylinders had been rebored the cylinders would have been larger than that. But I did say that this Defendants' Exhibit 3-W had a larger clearance than was used in the 5" trunk type Liberty Motor airplane engine.

Q. You assume it had .028 clearance? A. No, I assume it had .025 clearance.

Q. What made you take that figure? A. Why, I made a rough measurement on it before my cross examination, just to get a rough idea of the diameter, and I took .025 clearance just to be on the safe side. Even with a .025 clearance, I think the calculation gives about 470 degrees Fahrenheit above the temperature of the cylinder.

Q. Now, Mr. Gunn, you say he was familiar with these piston problems? A. Yes, he was.

Q. Did you consider his opinion good in 1920? A. Yes.

Q. He didn't deliberately make a mistake, did he? A. Well, I don't think he did.

Q. He was rather careful in making statements, wasn't he? A. I don't know that he was.

Q. Well, do you think he would have made wild statements without basing them on something? A. No, I wouldn't characterize him as being wild about statements he would make.

Q. Did you read this article on Aluminum Piston Design in Automotive Industries of January 29, 1920, which is in evidence? A. Yes.

Q. Do you remember whether you read it at that time? A. No, I don't remember whether I did or not.

Q. Well, you kept pretty close track of piston designs, didn't you, in those days? A. Well, fairly close track.

Q. Now, in referring to Fig. 8, two views on page 363 of that article, you stated that that piston was about the same as Exhibits E and F, with the exception of the boss relief. The boss relief is not illustrated in that Fig. 8? A. Yes, I made that statement, but my attention was called to the special boss construction.

Q. Oh, yes, I am not stressing that point. I got your explanation on that, I think the Master did, too, however, you can repeat it if you want to. A. No, there is no relief shown in the drawings in Fig. 8.

Q. The parts of the figure on the left, that was the cross section, seems to indicate that the wrist pin boss connects directly with the web, doesn't it? A. Appear to be, yes.

Q. Now the Fig. 10 on page 894, at the left, two figures, that is of the Franquist piston, is it not? A. I should say Fig. 9 is of the Franquist piston.

Q. That is what I mean, Fig. 9, yes. That is the Franquist patent, 1,153,902 corresponds generally to that, does it not? A. Yes.

Q. Now, there is no relief shown there, either, is there, in the region of the wrist pin bosses? A. No.

Q. In fact, in all of these pistons that Mr. Gunn illustrated do you find a single case where there is a relief shown in the region of the wrist pin bosses? A. Yes.

Q. Where? A. Oh, Fig. 5, for example, the hour-glass piston; Fig. 6, the Ricardo piston.

Q. Oh, yes, those are constructions where it stands out like a sore thumb, Dr. Jeffries, but you don't find relief shown in Fig. 1, Fig. 3, or Figs. 9, 10 or 11, nor in Figs. 7 and 8, do you? A. No, just in Figs. 2, 5 and 6, I believe.

Q. And that is because they were of the hour-glass and slipper type construction, and he couldn't help but show it? A. Not so with Fig. 2, however.

Q. Fig. 2, that shows a distinct relief in the region of the wrist pin bosses, does it not? A. Yes, it does.

Q. But there is no question about the Franquist patent disclosing relief in the region of the wrist pin bosses? A. No, the Franquist specification states that there is to be extra clearance in that region.

Q. But Mr. Gunn didn't even refer to that? A. No.

Q. In fact, he don't refer to relief as to any of these pistons, does he? A. No.

Q. As a matter of fact that would be understood by an engineer at that time, that there were reliefs? A. Oh, I think not.

Q. You think not? A. A relief, especially in combination with these other things, is something which is vital to certain of these constructions; where it is, of course it should be mentioned and described.

Q. I am not asking you to repeat that every time, Doctor. I think both myself and the Master understand your theory that these are combinations as distinguished from aggregations, and that the relief enters into every one of these constructions. You don't have to repeat it unless it is absolutely necessary. I am asking you this plain question, whether an engineer, in looking at a piston in 1920 or even as early as 1915, found it necessary to repeat every time that you must relieve this piston in the reginh of the wrist pin bosses, or it is desirable to do so? A. Well, that may be your idea, but I get the impression you were asking me to read into most any

prior art piston, one at a time, each of these elements and combinations in the patents in suit.

Q. I am just simply taking the position, Dr. Jeffries, of the Supreme Court of the United States in *Webster Loom Company vs. Higgins.*

Mr. Richey: I think the witness is entitled to explain his answer.

Mr. Bruninga: He is entitled to explain his answers, but let him give his answer and then if he wants to qualify it later on he can do it on re-direct.

Q. You said that this article represented the efforts that were made to solve the problem, and that it did not do so, and did not give the public a solution. Now, this was January 19, 1920. Was Mr. Gunn familiar with what was being done at the Aluminum Company of America by Mr. Jardine? A. I don't know whether he was or not.

Q. He was with the Packard Company at that time, wasn't he? A. I think so.

Q. And there was rather close friendly connection between the engineers of Packard and the Aluminum Company of America and of the subsidiaries around there? A. Just the usual relationship between the automotive engineers of the manufacturing companies and the automotive engineers of the parts companies.

Q. But he does mention the Long piston and the Franquist piston, and he says pistons of the Long and Franquist type are split to allow the piston to spring? A. Yes.

Q. Now, did he make a mis-statement, or is that a correct statement? What occurs on the first page of the article A. He made a statement which is probably correct, qualitatively, at any rate, but his statement was not very accurate with respect to Franquist.

Q. You think it was accurate with respect to Long? A. Oh, I think so.

Q. You were familiar with the Long piston at that time, weren't you, in January, 1920? A. I don't know whether I was or not.

Q. Well, where did you get your information as to the Franklin Company asking the Aluminum Company of America or its subsidiaries to make these Long piston castings? A. In the Aluminum Company.

Q. In the records? A. Oh, no, just I saw the pistons being made.

Q. By the Aluminum Company of America? A. Yes. Then I have seen the castings lying around at the Aluminum Company plants.

(Short recess taken.)

Q. In what plant of the Aluminum Company did you see those Long pistons? A. At the Harvard Avenue plant in Cleveland.

Q. What year? A. Oh, I don't know what year; I think it was around 1920, though.

Q. You say that none of these pistons in this article gave the solution to the problem? A. That is correct.

Q. You regard the Long piston, then, as not being any solution to any problem? A. It is not a solution to the automotive piston problem, no.

Q. Well, do you know of any split piston that was in use before Long, in actual commercial use? A. I don't know that I do.

Q. The Jardine piston never was in commercial use, was it? A. I think not.

Q. You know it wasn't in commercial use. You don't know of any car that it has ever been used in? A. No, I do not.

Q. You don't know of any car that the Gulick piston has ever been used in, do you? A. No, not a piston like the Gulick drawings.

Q. Yes, that is what I am asking about. Do you know of any car that the Mooers patent piston was ever used in as shown in the drawings? A. No, not as shown in the drawings.

Q. You don't know of any car that the Schmiedeknecht patent was used in? A. No not as shown in the drawing.

Q. And you don't know of any car that the Schmiedeknecht patent was used in? A. No, not as shown in the drawing.

Q. Then of all of these patents in suit there is only the Maynard patent structure as shown in the drawing that was ever used commercially? A. So far as I know.

Q. And that has not got the relief on the thrust face, has it?

Mr. Richey: Haven't we been over that enough?

Q. That is, relief in Exhibit 1. A. It has not got the bending in of the webs like in Exhibit 1, at the ends, no; but it has relief around the bosses in combination with the horizontal slot and the vertical slot.

Q. Yes. Doctor, you understand what I mean,—the relief on the thrust faces, which is the part between the sharp edge of the round part to where the web goes to the wrist pin boss. A. Yes, I understand what you mean; but that is essentially a bending-in of the web at the end.

Q. The Maynard patent doesn't illustrate that, does it? A. It doesn't illustrate that particular point, no.

Q. So when you said that the article represents effort made to solve the problem and that it did not give the public a solution, you counted in your statement the Long piston; is that right? A. Yes.

Q. And you know, don't you, that the Franklin automobile was the worst kind of an automobile to try out an aluminum piston in? A. Why, I know it was a pretty difficult car to put an aluminum piston in, yes.

Q. Well, it was an air-cooled engine, wasn't it? A. Yes.

Q. And that is about the worst condition that you encounter in automobile practice where you want to use an aluminum piston? A. I think that is true.

Q. And you know that that Long piston was used commercially in the Franklin automobile, don't you? A. Yes.

Mr. Richey: Not the one that was shown in the Gunn article?

The Witness: No.

Q. But like Exhibits E and F? A. Yes, those were used.

Q. And you make a distinction then, between the ones shown in the Gunn article and between the E and F? A. Yes, there is a distinction in the construction and there is a distinction also in the finish of the piston.

Q. The finish of the piston, so far as relief in the region of the wrist pin bosses? A. That is correct.

Q. You said a trunk type like shown in Fig. 1 of the Gunn article was successful? A. Yes, it was successful to the extent that it was used by the millions prior to the advent of the split skirt piston.

Q. And the construction Fig. 2 was also used, was it not, with the relief in the region of the wrist pin bosses? A. Yes; that happens to be, I think, the Liberty type piston.

The Master: You mean the Liberty airplane motor?

The Witness: Yes.

Q. Now, referring to the Van Bever patent, you stressed the point that the patent drawing showed a ring inside of that piston which would make the skirt stiff? A. Yes.

Q. But that was promptly left out of the Franklin automobile piston as shown by Exhibit B? A. Yes.

Q. And it operated to some degree anyway, didn't it? A. It gave flexibility to the bottom of the skirt, which has never been any problem as far as I know.

Mr. Richey: Pardon me, was that answered?

The Witness: I say, it has never been any problem to get flexibility to the bottom of the skirt, as far as I know.

Q. But as soon as that ring was taken out, the skirt did, at least a part of the skirt, became flexible? A. Yes, the bottom of the skirt.

Q. The function of that ring was to adjust it; isn't that right? A. Yes.

Q. And hold it rigidly in adjustment; is that right? A. That is right.

Q. And as soon as you took out that ring, it took out the function of adjustment and the rigidity of adjustment? A. That is right; you no longer had Van Bever, as I see it.

Q. You mean you don't have Van Bever any longer as specifically described in the Exhibit or as shown in the drawing? A. Yes, or in function.

Q. You don't apply that same rule to the patents in suit? A. Yes.

Q. You just look at the drawings and any deviation from them is heresy? A. Oh, I think I gave a fair representation of it; at least I tried to.

Q. Now, when you come to the Vincent patent 1,279,184, in the construction shown in Fig. 7, Vincent left out the positive adjusting feature of the Van Bever patent, didn't he? A. Yes.

Q. The spring ring inside didn't hurt it any, did it, didn't hurt the Vincent construction any? A. Well, it makes it heavier.

Q. How much heavier? A. I don't know.

Q. Very little; isn't that right? A. Some heavier, at any rate.

Q. Would you say over two per cent heavier? A. I don't know.

Q. Do you know that the Franklin Company used such rings in Exhibit B? A. I never knew it, no.

Q. But it doesn't interfere with the contraction of the skirt, I mean with the closing of the slots to compensate for expansion, does it? A. It should not.

Q. You said there was no horizontal separation in the Vincent patent construction. Don't you find horizontal separation in Figs. 1 and 2, horizontal separation between the skirt and the head? A. Yes. I mentioned the composite type of piston, the head in one piece and the skirt in another, and some connection in between of some sort.

Q. And that is not contemplated by any of the patents in suit, the possibility of a two-part piston? A. I don't know whether it is contemplated by any of the patents, but all of these constructions are integral constructions that we are dealing with here.

Q. What do you think is meant in the Moocrs patent in suit, page 2, lines 30, *et seq.*, "It will be understood that this relationship might be of a poor mechanical fit or joint which would be a poor conductor of heat as compared with the metal of the head 2 and connectors 3, so that such heat as did pass from the head 2 to the skirt 1 would do so principally by way of connectors 3 rather than from the head to the upper end of the skirt 1 directly." Do you think that contemplates an integral or two-piece construction? A. Oh, I think that contemplates an integral construction. Certainly the connectors, he says, are to be integral with the head and the skirt. I interpret that as merely emphasizing the fact that this horizontal separation is to be of poor heat conductivity.

Q. A poor mechanical fit or joint, in your opinion then, contemplates an integral construction? A. It says that "its relationship might be that of a poor mechanical fit or joint which would be a poor conductor of heat." That is the relationship between the connectors which conduct heat readily, and the horizontal separation which does not conduct the heat readily.

Q. And that is what you understand by the construction, even though the words "poor mechanical fit or joint" are used? A. I should think so. It says, "this relationship might" do that. It is not that the construction is that; it is the relationship so far as the heat conductivity is concerned.

Q. You think that in the Vincent patent, Figs. 1 and 2 the flow of heat from the head to the skirt would be the same whether the head and skirt were integral or connected by a joint? A. No.

Q. There will be retardation of the flow of heat, will there not? A. Yes.

Q. But again, Mr. Vincent doesn't specifically say that the skirt is relieved in the region of the wrist pin bosses? A. No, he doesn't, as I read it.

Q. Turning next to the Rainforth patent, your position is that it is impractical for the reason that the skirt has to be sprung into the cylinder; in other words, compressed to be sprung in? A. That is one reason, yes. That is what the patent says, it has to be sprung in; that would be impracticable.

Q. That would be impracticable? A. Yes.

Q. Why is that impracticable? A. Oh, if you have enough flexibility so that the piston skirt is sprung in, you wouldn't have enough rigidity to hold the thrust forces.

Q. When Mr. Gulick said that he actually pushed his piston into the cylinder, in his 1911 and 1914 pistons, the pistons were therefore impracticable? A. Oh, every piston has to be pushed into the cylinder.

Q. Well, don't you think that is what Mr. Rainforth meant? A. Hardly, when he said "sprung."

Q. Well, if a split piston has to be pushed into the cylinder, there is a springing to a slight amount anyway, isn't there? A. There might be in the assembly; they might use the spring somewhat in the assembly. That is not the only thing the matter with this piston, however.

Q. The main thing the matter with this piston is that he doesn't disclose all of the features of each of the patents, is that right? A. The main thing about it is that it just wouldn't be any good, as it has nothing to commend it for use.

Q. You have never used such a piston, have you? A. No.

Q. Have you ever tried one out? A. No.

Q. Do you know whether D. Napier & Sons, Ltd. have tried one out? A. No.

Q. Well, you don't know that they didn't try one out? A. No.

Q. Were you very familiar with the Napier cars of that date? A. No.

Q. How do you know, then, that it was never used by Napier? A. I didn't say that it wasn't.

Q. The only thing that you can say is that you never saw one of these pistons; is that right? A. That is correct.

Q. You don't think it was even an advance in the art in 1912? A. No.

Q. Did you have in mind when you discussed this patent that the specification disclosed on page 2, lines 7 *et seq.*, and particularly in lines 8 and 9, that these slits "may, if desired, be extended towards the outer end of the piston so as to be open at that end"? A. I had that in mind, yes.

Q. There is certainly plenty of relief around the wrist pin bosses, isn't there? A. Of a kind, yes. The bearing surface in fact is very meager on that piston.

Q. The diameter of the part below the rings is the same as of the ring lands, isn't it? A. The part below the rings?

Q. Yes, the diameter of the part below the lowermost ring is the same as the diameter of the other ring land? A. I don't know. The whole head or some part of that head portion must be the upper bearing of the piston on the thrust, in the thrust faces.

Q. You say "must be"? A. Yes.

Q. Why do you say "must be"? A. Why, because there couldn't possibly be a complete bearing below the boss; so there must be a bearing some place above the boss, and it has to be some place around those ring lands. There is not enough strength, wouldn't be in any metal of any construction, even today, without those vertical slots to hold the bearing of the piston entirely below the boss.

Q. Do you know that from experience or from theory? A. Oh, I know it from experience and from theory.

Q. Experience with this particular piston? A. No, experience with pistons.

Q. But the mere fact that the piston is sprung into the cylinder, and with the slots made wide enough, that doesn't mean that it would seize? A. No, not necessarily. The metal might be so thin that it has a lot of spring.

Q. What do you gather from the following statement in the patent, at page 2, lines 13, *et seq.*: "Again a U-shaped slit may be formed in the outer portion of the piston, the length of the U being transverse to the axis of the piston, and transverse slits may be arranged in a variety of ways to produce springy tongue-like portions which shall produce the required result in a manner similar to that in which the slits D act." A. Just a sort of

war on words, with the exception of the specific U-shaped portion that it described.

Q. When the specification says: "The transverse slit may be arranged in a variety of ways," that is where you stop? A. Yes. It is like trying to reach somebody by telephone when you don't know his number, and starting with the dial.

Q. You have no imagination to figure out in your own mind that the fellow meant anything else but a U-slot with its axis transverse to the piston; that is all you could gather? A. Nobody else ever seemed to gather anything.

Q. I am asking you what you gather? A. I would be just probably like the other people, only not as good as a lot of these inventors that worked on this problem. It seemed to teach nobody anything.

Q. That is all you personally gather out of it, that the U was only transverse and made exactly to a level of the piston? A. What difference does that make?

Q. I am asking you. Then you can ask me some questions. (Question read by reporter.) A. No, I would even give it considerably more leeway; still he wouldn't have anything.

Q. Now, taking up the Spillman patent 1,325,176, your statement about that piston was that it was just no good? A. Yes, that is right.

Q. You know it has been manufactured by the Kant Skore Company of Cincinnati? A. Yes.

Q. For a good many years? A. I don't know how long.

Q. Well, you know that it was the piston, that it was that particular piston which was involved in the suit that the Aluminum Company of America filed against the Kant Skore Company in 1923, and it was tried, I think, in 1923. You know that, don't you? A. The Aluminum Company filed—I don't remember that.

Q. Well, I can't remember all these subsidiaries—Aluminum Manufacturers, I believe it was at that time, —was the name given to the subsidiary. A. Well, I think that suit was on the process patent.

Q. Yes, but the particular piston which was an exhibit in that case was exactly like Exhibit 3-Z? A. Yes. I don't know that I recall that there was such an exhibit, but there may have been.

Q. Well, you testified as an expert in that case, didn't you, Doctor? A. Yes. But I don't know what

exhibits were in the case, and if we had a piston like this before me, then I was thinking of it more from the standpoint of the structure of the metal in the piston and the process by which the piston had been made, rather than its design.

Q. Well, one of those patents involved a piston having a definite alloy of aluminum, copper, and magnesium, and other trimmings? A. Yes.

Q. And you must have examined the piston in that case, didn't you? A. Well, I don't know as I examined the finished piston. I examined piston castings.

Q. You don't even remember that you had that piston before you, or a piston exactly like that, a finished piston, when you testified? A. No, I don't remember that.

Q. You can't say then whether that piston was the one whose manufacture by Kant Skore Company caused the Aluminum Company to bring that suit? A. No, I can't say that. I don't know at the moment just which piston castings were involved, but I know that the Kant Skore Company made these pistons, made pistons like this and sold them.

Q. Oh, you do? A. Oh, yes.

Q. You know that they made those and sold them in 1923 around the time of the suit? A. Well, I don't know in 1923, but some time around 1923 or earlier.

Q. Well, the Aluminum Company of America or any of its subsidiaries, or Aluminum Manufacturers, wouldn't have brought suit and gone to the expense of bringing suit had the company put out a perfectly worthless thing which would put them into the hands of receivers anyway? A. Why, yes, I think so. That is one of the things they wanted to guard against, having worthless things go out onto the market.

Q. Was it a sort of high-minded thing to protect the dear public, to bring that suit? A. No, it was a business proposition.

Q. It was a straight business proposition? A. Yes, certainly.

Q. You know, don't you, that the Cleveland Trust Company, or The Cleveland Trust Company through the Aluminum Company of America, or through Aluminum Manufacturers, has been collecting royalty from Kant Skore on that particular piston? A. No, I don't know that.

Q. You don't know that? A. No.

Q. You can distinguish then between the collapsing effect of 3-Z and 48, can you? A. Yes. I know that type 3-Z piston collapses. I have seen a good many of them in the collapsed condition. Of course aluminum collapses a good deal easier than cast iron anyway.

Q. You mean by that that the 48 wouldn't be suitable for aluminum, Exhibit 48? A. 48 wouldn't be so good for aluminum,

Q. Would you say, as you said about the Kant Skore piston, that Exhibit 48 is just no good? A. No, I wouldn't say that.

Q. But you say Exhibit 3-Z is no good? A. Yes, yes.

Q. In spite of the fact that Exhibit 3-Z has got reliefs on it and Exhibit 48 has not? A. That is correct.

Q. One of your objections to the Spillman patent structure 1,335,176, and 3-Z is that it has slots on both sides which makes it worse? A. That is right.

Q. They could have been left out on one side, couldn't they? A. Yes.

Q. And that is done by the licensees under the Jardine patent, even if the Jardine patent does show two slots? A. Yes.

Q. Did you say that the Kant Skore Company went to the manufacture of a piston like Exhibit 1? A. Yes.

Q. And also the strut piston? A. Yes.

Q. Now, that Exhibit 1 was being used by the Ford Motor Company? A. That Exhibit 1 was being used by the Ford Motor Company, that is the Ford piston.

Q. Adopted as standard equipment? A. Yes.

Q. And it is a little bit hard to sell a jobber or a dealer anything except standard equipment? A. I don't know.

Q. But that was an advantage to cut down sales resistance that Kant Skore could put out a duplicate Ford piston or duplicate the car manufacturer's piston generally? A. I should say that was an advantage.

Q. What is the first split piston you ever saw in commercial use? I will limit it to that. A. Any kind of split?

Q. Yes, any kind of split. A. The Franklin, with the bottom of the skirt split.

Q. Like Exhibit B? A. Yes.

Q. And that was followed by the Long piston, wasn't it? A. Yes.

Q. And that was followed by the Kant Skore piston? A. Oh, you mean that was followed in my experience by the Long piston?

Q. Yes. A. Oh, I don't remember the second split skirt piston that I saw; but I think it was Jardine, was the second one.

Q. Like the Jardine patent in suit? A. Yes.

Q. Taking up next the Long patent 1,395,441, you say as you read that patent, the skirt is the same diameter all the way up to the ring groove 2? A. Yes.

Q. That is the way you understand it? A. Yes.

Q. That is what you understand the word "adjacent" to mean? A. Oh, it may mean a variety of things; it usually means near.

Q. It means "neighboring," doesn't it? A. Yes.

Q. Now, when the statement is made on page 2 of the specification, lines 4 *et seq.*, "In a piston of this improved character it is preferable to have the solid end 1 of the piston of a lesser diameter across the peripheral surface adjacent the piston ring recesses 2 than the remaining lower portions of said skirt." A. Where do you see "said skirt"?

Q. Oh, the "lower portion of the piston." Thank you. What are the parts adjacent the lower ring groove 2,—only the upper part? A. No, both parts are adjacent.

Q. And if anybody told you to have the solid end of the piston of lesser diameter across the peripheral surface adjacent the piston ring recesses than the remaining lower portion of the piston, you would stop right at the lowest ring groove? A. Well, I think that is where the line should be drawn, particularly in view, in this case, of Long's other two patents, one of which appears to be about the same date of filing as this one, in which he actually shows the head relief extending up to the horizontal slot.

Q. There is no question about the disclosure in the Long patent 1,489,499 and 1,872,772, as to how far the reduced diameter goes down? A. None at all.

Q. To the top of the slots? A. That is correct. Such an important point in that patent 1,395,441 should be singled out and pointed out.

Q. If you had these two patents before you, filed on the same day, 1,395,441 and 1,489,499, you would absolutely close your eyes to the statement in the second patent in considering the first one? A. No, I think I would open my eyes.

Q. You would open your eyes and you would actually use the same feature in the first patent that you would in the second; isn't that right? A. No, I don't believe I would. I think the two constructions are different. One is a double-walled structure; the other a single-walled structure.

Q. Whether double-walled or single?

Mr. Richey: Just a minute. Let him answer.

The Witness: I think that a point as important as that in patent 1,395,441 should be singled out as carefully as it is in the other patents.

Q. It should be repeated in every patent thereafter to the end of time; is that right? A. This wasn't a patent thereafter; it was a patent application that was concurrent with the others.

Q. I notice that neither one of these Long patents 1,395,441 and 1,429,499 show that there are oil holes in the wrist pin bosses. Don't you think that is a vital defect and therefore that the whole thing would seize? A. It is not an important point in what he thought was his invention.

Q. You don't think that is sufficient, then, to permit you to throw both of these Long patents out? A. Not on that ground, no.

Q. Suppose the Long patent structure, the one in 1,395,441 was used with the skirt of uniform diameter and you started to run it in a cylinder, wear would take place, wouldn't it? A. Yes.

Q. That would reduce the skirt in the region of the wrist pin bosses, just scuff it off? A. Why not,—I think it would reduce the skirt mostly in the upper part rather than around the wrist pin bosses.

Q. You don't think there is any chance then of this diametrical expansion pushing out the wrist pin bosses you have been talking about with reference to all these patents, especially since there is a slot separation on both sides? A. Oh, the wrist pin relief in combination with those other things would be helpful, but it depends on the clearance the piston is fitted in the cylinder, among other things.

Q. Well, whether you had relief or not, the skirt would expand in the region of the wrist pin bosses more than at right angles to it? A. Yes, it would.

Q. And it would begin to wear down, wouldn't it? A. It would bear against the cylinder there.

Q. And in the end you would have relief opposite the wrist pin bosses? A. Oh, I would hardly call that relief opposite the wrist pin bosses. You would also have some flexibility at the bottom of the skirt which would help push the boss region in in response to cylinder wall pressure in this piston.

Q. And the little narrow part above the slot 9a, Fig. 2, would wear off very rapidly, wouldn't it, if it wasn't of full skirt diameter? A. It might, if the clearance was small.

Q. But the parts bounded by the slots 9 and 9a would flex in? A. Yes, they would.

Q. Now, one of your objections to the Long patent 1,395,441 was that it has complicated slotting as shown in Fig. 1. That was one of your objections, wasn't it? A. Yes.

Q. Reading the patent, do you think that one skilled in the art would inevitably come to the conclusion that you had to use that particular slotting of 1 with the particular slotting of Fig. 2? A. Do you have reference to any particular part of the patent?

Q. No. But reading the whole patent, reading the patent and looking at the drawings, was it your idea in reading this patent that you had to use those two together? A. Well, the patent appears to be quite specific in its description of the drawings.

Q. It is your idea then, is it, Doctor, as you read patents like the Long patent and others, that you should not deviate one bit from it; that you should be sure to put Fig. 1 on one side and Fig. 2 on the other side of the piston?

Mr. Richey: I object as indefinite, unless he says what other patents he means.

Mr. Brueninga: Well, strike out "other patents."

A. No, I think that the patent should be read not only with the idea of its construction, but the mode of operation and the results in mind.

Q. Just answer my question.

(Question read as amended.)

A. I think that is an answer, isn't it, to your question?

Q. Your idea then, is—I want to make it clear without a lot of explanation—that as you gather the patent,

you wouldn't have to put Fig. 1 on one side and Fig. 2 on the other side; you as one skilled in the art would know that? A. No, I think not from this patent, unless there is something in the description itself that guides one in that direction.

Q. What is the difference between the Long patent 1,395,441 and Exhibit CCC? A. One difference is that in Exhibit CCC there is horizontal slotting on both sides of the piston, the horizontal slots separating the head section from the skirt section, whereas in the Long patent 1,395,441 the horizontal slots are in the upper part of the piston. The Exhibit CCC has only one vertical slot in one thrust face, and the other thrust face is left solid; that is another difference. Another difference is that the Exhibit CCC has generous relief around the bosses and extending to the top of the skirt, and the relief overlaps the horizontal slot on both sides of the piston. Exhibit CCC has combinations of elements, therefore, not found in Long. It also has a construction different from Long, and would have a different mode of operation and would give different results.

Q. But if the Long patent had added to it those features that you distinguish from it, there would be no difference? A. Axiomatically, so, if one made the CCC piston and incorporated the changes necessary to make it, and called it "Long," what you say would be true.

Q. But those three distinctions that you just gave me are the only three distinctions you can think of? A. Well, those are the essential differences, as I see it.

Q. And the first of them is due to the fact that since the lower ring land in Exhibit CCC is reduced in diameter to the same diameter as the ring land— A. Yes.

Q. —that therefore there is a separation of head and skirt? A. That is correct.

Q. The second one is that there is a relief in the region of the wrist pin bosses which is specifically described in the Long patent? A. Yes, except that relief is quite special in the CCC piston; it extends clear to the top of the skirt and overlaps the horizontal slots, which gives a combination of structural elements producing beneficial results.

Q. And the third one is that the slots 4-4 and 8, Fig. 1 of the Long patent have been left off of CCC? A. Yes.

(Thereupon, adjournment was taken to 1:30 P. M. of the same day, Tuesday.)

(At this point the testimony of Tibbetts, Record pages 877 to 895, was taken.)

(Thereupon at 9:30 A. M., Wednesday, March 22, 1933, the hearing was resumed.)

ZAY JEFFRIES resumed the stand for further Cross EXAMINATION.

Q. You were talking about the Long patent when we adjourned, Doctor, but I want to go back to the Monckmeier piston for just a little bit. When does an iron piston begin to pick up carbon? Oh, you can state it generally the time, distance, number of hundreds or thousands of miles. A. It is not a question of mileage; it is a question of temperature.

Q. It might pick it up in one day? A. Yes, yes, it might pick up carbon in one day.

Q. In noticeable, permanent deposits, hard? A. Yes.

Q. That is your opinion? A. Yes; the carbon isn't a question of time; it is a question of temperature and running conditions, and oil.

Q. In other words, you think that in the course of maybe an hour's running, an iron piston could collect carbon deposits of carbon which would have to be scraped off? A. Oh, I think so. As a matter of automotive engineering there are two temperature ranges that are critical in carbon deposits; one is that the parts should be kept below a certain temperature and then it will not carbonize; it should be kept above a certain temperature, and then it will not carbonize. It should be kept above a certain temperature, and then it will not carbonize. The piston heads sometimes get so hot that the carbon will not deposit on them; that is the upper temperature level.

Q. And you say that is not only true of the head, but down along the skirt say below the wrist pin boss on a piston like the Monckmeier piston 3-V? A. No, that can never get so hot that the piston will not carbonize.

Q. What do you say, how long it would take to cause a deposit of hard, fairly permanent carbon on it that would ha to be scraped off in order to get it off? A. I don't know. The matter of the hard deposit is one in which the temperature also plays a part, but the accumulation of carbon of course becomes much greater as time goes on. That is, a small deposit of carbon some times makes it easier for the next deposit to take place,

and so on, until the deposit builds up to the point where it flakes off, some times in the motor, or where it builds up to quite a thickness and becomes objectionable in the operation of the motor.

Q. Now, what causes the deposit of carbon on the head of a cast iron piston? A. It is the charring of oil which gets onto the head of the piston.

Q. It is a regular frying process, like putting oil in a frying pan, isn't it? A. Yes, a good deal.

Q. Now, that extends for some distance along the piston, along the sides of the piston? A. That may, or the carbon from the flame may be carried down the piston by the gases. Of course any kind of yellow flame is just full of carbon, full of soot.

Q. And that frying process is the greatest at the hottest spot, isn't it? A. No, at the hottest spots the oil can completely volatilize; that is, a piston head can be hot enough so that the carbon will not deposit on it.

Q. That didn't happen in 3-V, because there is carbon on the head? A. Well, it didn't happen at some stage of 3-V or in all parts of 3-V.

Q. But an actual frying process did happen in 3-V? A. I think so, yes.

Q. And an actual frying process also happened in the region of the wrist pin bosses? A. Oh, I couldn't say that; I don't know.

Q. There is where the greatest amount of carbon is on the Monoknecier piston, isn't it? A. No.

Q. Apart from the head? A. Oh, apart from the head. Well, apart from the ring grooves, too, and that deposit is very thin.

Q. But that deposit in the region of the wrist pin bosses is the greatest on the entire skirt; isn't that right? A. It is the most evident.

Q. And that is the hottest part of the skirt if you have connectors and slots in it? A. Yes, it would be.

Q. Doesn't that to your mind, Dr. Jeffries, prove that piston actually did run with the slots in it so that the hottest part of the piston was right in the region of the connectors where the greatest amount of carbon was deposited? A. No, that doesn't prove that at all. There is another reason why carbon might be deposited there, and that is the weaving of the skirt as a result of the wrist pin pressures, would have a tendency to have that adhere there and to make cavities for the oil to get in. There are also two little oil grooves there for the oil to run. There is no way, as I mentioned on my direct exam-

ination, for me to tell whether the slots were in the piston when it was being run or whether they weren't, and I don't think it makes any difference as far as that is concerned; but the evidence on the piston itself is in the direction that the slots were put in after the piston had been run, such evidence as I can gather.

Q. Such evidence as you can gather. There is none whatsoever that they might have been run for several hundred or a thousand miles with the slots in them? A. Not the slightest, no more than the deposit of carbon around the bosses of Defendants' Exhibit 3-H piston would indicate that the skirt had to be slotted while the piston was being run.

Q. It is a fact, isn't it, that if those slots are in 3-V, those cross slots are in 3-V, the hottest part of the skirt is right in the region of the wrist pin bosses? A. That is correct.

Q. It is also a fact, isn't it, that those slots are in there and if you have a splash system, oil can splash into those slots and to some extent start that frying process in those slots? A. Yes, to some extent. But if that were the case, the oil would be spread over certainly the upper surface of both of the horizontal slots, and that portion would be hotter than the skirt portion adjacent the bosses, and that should have charred and produced carbon in those slots.

Q. In an automobile having a crank case and where you have splash lubrication, there is a continual fog of oil in that crank case and going up into the piston; isn't that right? A. There should be at each stroke.

Q. Well, at each stroke that may be true, but the pistons run so fast that there is a continual fog right inside of those pistons; isn't that right? A. Well, I don't know what the conditions were there; but I do say that if the conditions were right for charring at this particular point, the end of the horizontal slot near the boss which is not cracked, then the condition should have been right for charring 1/16" or 1/32" from that particular point in the upper surface of the horizontal slots.

Q. Now then, to get a clear picture of the piston, particularly a cast iron piston, still more particularly Exhibit 3-V, the hottest part of that piston is the head? A. Yes.

Q. The top of the head; and then the temperature gradient goes down, the hottest part of the skirt in a piston like 3-V is in the region of the wrist pin bosses below the connectors; let's call them congectors; that is right, isn't it? A. That is correct.

Q. And in such a piston like 3-V, slotted as you have it here, the coolest part of the skirt is below the horizontal slots, the region below the horizontal slots? A. Oh, the coolest part of the skirt is the bottom of the skirt. The coolest part of the top of the skirt is just below the horizontal slots. I would like you to keep in mind in these answers that these horizontal slots do not make the usual head-skirt separation in Exhibit 3-V. The head-skirt separation, that is the guide section, goes up at least to the lands on either side of the top.

Q. Yes, I am taking your answer with that reservation when I am talking about the skirt, I was talking about the skirt part below the horizontal grooves. A. Yes.

Q. And the grooves themselves as well as the lands in the piston are continually subjected to oil or spray or splash? A. Yes, they should be; so is the cylinder wall, which continually subjects the outside of the piston to oil.

Q. Now, you called particularly attention to the pistons Exhibit F and Exhibit E the Long pistons, and the collection of carbon deposit on those pistons, particularly in the slots. You have every reason to believe that those pistons were run in a Franklin air-cooled engine? A. Yes.

Q. And that the cylinder of that engine becomes very hot, does it not? A. Yes, it gets quite hot.

Q. Much hotter than a water-cooled engine? A. Well, hotter than most of the pleasure car water-cooled engines, yes.

Q. You would rather expect more deposit of carbon in a piston in an air-cooled engine than in a water-cooled engine, wouldn't you? A. In certain parts, yes; not necessarily on the head.

Q. Examine Exhibit 48 and tell me whether after the cutting of that slot there is not evidence of a springing of one part with respect to the other, especially at the top? A. Yes, there is.

Q. That takes place when you split a cast iron piston? A. Some times it does and some times it does not.

Q. That springing may be either in or out? A. Yes, it may be either in or out.

Q. Depending on the strains that are set up during the casting; is that right? A. That is correct.

Q. And such a thing could just as well happen in the Monckmeier cast iron piston, Exhibit 3-V? A. Yes, it might.

Q. One of the advantages of an aluminum piston is that it will conduct heat quickly; isn't that right? A. Yes.

Q. And a cast iron piston will not conduct heat nearly as quickly as an aluminum piston? A. No; about one-third, I think.

Q. A cast iron piston therefore runs at a higher temperature than an aluminum piston in actual service under the same conditions? A. Under the same motor conditions, that is correct.

Q. And therefore the liability to deposit carbon on a cast iron piston is much greater than where an aluminum piston is used? A. In the lower range, yes.

Q. What do you mean by the lower range? A. Well, I mean that with the lower temperatures encountered in the motors it is easier for a cast iron piston head to be heated hot enough so that it will not take a carbon deposit than does an aluminum head.

Q. Where a cylinder is run at a rather high temperature, there is considerable wall warpage, isn't there? A. There may be; there may not be.

Q. Now, if the Monckmeier piston, particularly 3-V, had not been reduced in diameter above the slot, that narrow ledge would soon wear off, wouldn't it? A. Well, I don't know how soon it would start to wear, because that would be the wearing of the upper part of the piston.

Q. Well, as an extreme, if it came to a point, it would wear off very quickly? A. Well, it might break off in that case.

Q. And the quickness of wear is determined by the vertical depth of that ledge, or I might say annular part between the lowest ring groove and the horizontal slot? A. That is one factor. The kind of use it has is another factor, and the degree of oiling is another factor. There are a lot of factors involved in wear. The amount of dust that gets into the carburetor is more important than any of the other factors.

Q. But if that wear did take place, it did not necessarily mean that the wings, what I might call wings, that is, the free part bounded by the horizontal and vertical slots, the wings could flex in? A. The wings, if they were slotted during the time when the piston was in the motor?

Q. Yes. A. Oh, they would have to flex. That piston, if it were slotted in use, that bottom of the skirt would have been quite flexible, and nothing could have prevented the bottom part of this piston from flexing

during the operation; but during the wearing off of this annular part above the slot, the side sections of the piston bounded by the horizontal slots and the vertical slots would be allowed to flex in while this wear of this annular part took place, that is true; it would have no part, however, in helping the piston to operate, because if the piston were slotted, the slotted part would wear just the same as the other part.

Q. But then as the wear took place, the slap would not increase, would it, as the wear on this annular part took place, these parts would still flex in and slap not take place? A. Oh, no, I don't think that is correct.

Q. You don't think so? A. No, I don't think that is correct. There has been ample clearance in that piston, slots or no slots.

Q. You say ample clearance because Mr. Monckmeier said it was fifteen thousandths? A. Well, measurements indicate it wasn't fifteen thousandths. The measurements indicate it was twenty thousandths or more, even when the piston was new, and a good deal more than that later.

Q. You say twenty-thousandths because you figure just about what the wear might have been? A. No, no; I say twenty-thousandths because the motor was supposed to be a 4½" bore motor.

Q. And you don't know what the diameter of that piston was when it was put in? A. Well, it wasn't large diameter, from the diameter across the boss faces on the skirt.

Q. You don't think there might have been wear across the boss faces? A. Not on the skirt, not very much.

Q. Then all of your talk about relief isn't so important, that is, relief in the region of the wrist pin bosses? A. Not when you have clearance like that, not when you have clearance enough to allow the piston to be heated 700° hotter than the cylinder, then the whole thing is relieved.

Q. Now, in an engine of the size of the Staver engine that you heard Mr. Monckmeier talk about, having only splash lubrication, that lubrication wasn't very efficient, was it? A. Yes, it is quite efficient.

Q. Splash lubrication? A. Yes, for lubrication. It is not very efficient for oil consumption, but it is very efficient for lubricating.

Q. Isn't it a fact that at high speed the cranks make almost a hole in that oil? A. Well, I know that to get

the best lubrication, especially with some of these aluminum pistons, they found the splash system to be preferable. It is not good for oil consumption from the standpoint of number of miles run per gallon of lubricating oil consumed; but it is quite efficient from the standpoint of doing a good job of lubricating.

Q. When a piston seizes, it usually seizes at the skirt, doesn't it? A. It usually seizes at the top of the skirt, yes.

Q. And with considerable wear of a piston such as Exhibit 3-V you would expect the diameter above and below the slot to be equal; isn't that right, after considerable wear? A. Not quite. The portion above the skirt is hotter, the portion above the horizontal slots is hotter; therefore in operation it would rub the cylinder a little harder than the portion below, and after the piston cooled down to room temperature, then that portion above should be a little less in diameter as a result of wear.

Q. In order that the master may have an idea of the measurements, what is the thickness of an ordinary piece of writing paper? A. I don't know that I have ever measured it.

Q. Do you know what the thickness of an ordinary piece of cigarette paper is? A. No.

Q. Do you know what the thickness of an ordinary hair is? A. Yes.

Q. What is it? A. From one thousandth to four thousandths of an inch.

Q. Now, you took these measurements of Exhibits 3-V and 3-W, and particularly 3-V. That is pretty rusty, isn't it? A. Yes.

Q. The rust on each face might be over a thousandth of an inch? A. Oh, around a thousandth, may be, yes. I can conceive of a thousandth variation in any one of the measurements that I took.

Q. Well, that was particularly true in the region of the wrist pin bosses where the carbon collected? A. Oh, most any place, I think, on the piston. The rusty surface is not conducive to fine or close measurements.

Q. I believe it would be well to explain the present method of oiling pistons as used in engines, pick out any one in which there is a direct oiling of the pistons as distinguished from splash lubrication, or in addition to splash lubrication? A. Well, there is one in which the connecting rod is made hollow throughout its length, and oil is forced through this hollow connecting rod up to the

wrist pin section and sprayed out into the interior of the piston during operation. That is not the most common type, however. I think the most common type is one in which the oil pressure is developed by a pumping system and at each revolution of the crank shaft a little jet of oil is squirted under pressure up into the cylinder bore. It produces what Mr. Bruninga has called a sort of fog or spray of oil in the bore of the cylinder.

Q. Now, let's continue with the Long patent 1,489,490. Look at Fig. 5. Is it your contention that there is no flexure of the web 8a during operation? A. Well, the webs would flex, yes, in the boss axis, but there is no flexibility of the webs in the thrust axis, as I see it.

Q. As the metal part of part 4, Fig. 5, between 8a, and 8a expands, the webs must flex? A. That is not a flexing of the webs, that is merely a change in position due to increase in temperature.

Q. Well, if there is no relief in the region of the wrist pin bosses, and with the skirt in the region of the wrist pin bosses bearing against the cylinder, and with these bosses again supported from the top of the skirt, don't those webs 8a actually have to flex as the expansion of 4 takes place with increase in temperature? A. Oh, no, they couldn't flex as the result of any change in the part 4. They would be flexible in the other direction, to an extent, that is, across the boss axis.

Q. They would flex along the boss axis, wouldn't they? A. Yes, they should, and the lower on the piston the greater the flexing, and by the time you reach the top of the skirt that would be very small.

Q. Would about the same flexing take place in the part 11, Fig. 4 of the Gulick patent, between the webs 17 and 18? A. Oh, no. The flexing in those Gulick webs would be very substantial.

Q. Because designed for flexing? A. Yes, and because of the complete horizontal separation and the vertical separation between the two webs. That construction is all in the direction of making the Gulick structure flex.

Q. You keep in mind, of course, that the part 4 is separated both vertically and horizontally from the rest of the piston in the Long patent 1,489,499? A. Yes.

Q. You don't think that is comparable at all with the parts 11, 17 and 18 of the Gulick patent, Fig. 4? A. No. No, I think if you took out the two slots, 5, and put in one right in the region of the figure 4, then those webs

would operate more like the Gulick webs, but as they are I don't see how they can.

Q. That is, if you took out the slots 5 in the Long patent, then flexing would take place? A. Oh, by putting in the slots in the right place.

Q. Now, your objection to this patent, at least one of the objections is that it is a double-walled structure. By that you mean it cannot be conveniently cast in a permanent mold? A. That is one of the objections to the double-walled structure, yes.

Q. You don't see any difficulty in making cores for that piston, do you, permanent mold cores? A. Yes, there would be difficulty.

Q. But it could be done, couldn't it? A. Possibly.

Q. As a matter of fact it is a simpler proposition than Exhibit E, assuming of course the slots will be cut later on in both cases? A. Yes, I should think it could be made as easily as Exhibit E.

Q. And Exhibit E is no doubt a permanent mold cast piston? A. Yes, it was cast in a permanent mold.

Q. Now, turning to the Long patent 1,872,772, one of your objections to this patent was it was too complicated. Is it more complicated than the Gulick patent structure? A. It is perhaps not more complicated in its structure, but it is more complicated in its operation.

Q. The fact is that it can be cast in a permanent mold? A. Yes, with difficulty.

Q. While Gulick's could not? A. That is my opinion, yes. The Gulick drawings, as shown in the Gulick patent, could not be cast in a permanent mold.

Q. Why do you say, "With difficulty," Doctor? How much experience have you had in casting pistons like Exhibit E? A. Well, I haven't had very much personal experience in casting pistons like Exhibit E, but I have had a lot of personal experience in casting pistons in permanent molds. I know this is regarded as a difficult permanent mold job.

Q. But Mr. Long was selling those pistons in competition with Cleveland Trust Company's licensees, wasn't he? A. I don't know whether he was or not.

Q. Well, you know that Mr. Long was sued for infringement of the Cleveland Trust Company pistons because he was manufacturing pistons of that kind, don't you? A. No, I didn't know that.

Q. It has been said here by Mr. McCoy that the suit was dismissed after Long agreed to be good and buy

his castings from licensees. I believe you heard that, didn't you? A. I don't recall. I didn't pay any attention to it if I did hear it.

Q. Do you know anything about that? A. No.

Q. If I am not mistaken the reference was at that time had to Exhibit FFF. That is really a fine piece of work, isn't it, so far as permanent mold casting is concerned? A. Yes, that is a very fine piece of casting.

Q. Well, suppose it is complicated and suppose it is difficult to cast, what does that mean—increase in cost? A. Yes, very substantially.

Q. What do you call "substantial"? A. Well, I mean that a piston like that would be too expensive to use in motor cars generally.

Q. It wasn't found too expensive to use, was it? A. Apparently wasn't for a time in the Franklin Motor Car, but that is a high priced car and was at the time that these pistons were being used in it.

Q. But still Franklin continued to use those pistons until 1926? A. Yes.

Q. And as early as 1922 the Maynard type piston was on the market, wasn't it? A. Yes.

Q. And to your knowledge not a single Maynard type piston has been used in the Franklin car, has it? A. Not without the other modifications, at least.

Q. What other modifications? A. Well, with the Invar Struts.

Q. Oh, you call that Invar Strut piston a Maynard type piston? A. No, I don't call it a Maynard type piston, but it may have some Maynard features in it.

Q. Then your objection to a double-walled structure is the complication of casting, isn't that right, that is what it comes down to? A. Oh, that is one, and extra weight is another. It is not so economical or commercial as the single-walled structure.

Q. And all of those objections also go to the Gulick piston as illustrated in the drawings? A. Yes, that is true, but there are other features of complications in the Long piston and in its structure and its mode of operation which do not apply to the Gulick construction.

Q. In spite of that fact Long has been on the market and Gulick has not? A. The Long type of piston has been on the market and the Gulick type piston, as shown in the Gulick drawings, has not been on the market.

Q. And one of your objections to the Long patent is, again, that it does not describe relief in the region of

the wrist pin bosses? A. That is correct, it does not describe such relief in combination with other features, such as horizontal and vertical slots, to gain skirt flexibility.

Q. But it does clearly disclose, without any question, the reduction in diameter of the piston to the top of the horizontal slot? A. Yes, it does.

Q. I believe I understood you to say if that feature was used relief in the region of the wrist pin bosses was not so necessary? A. No, it would not be so necessary as it would be in the other Long construction which we were discussing; it would still be helpful, however.

Q. Now, you took up Exhibits E and F, and then selected the sand cast piston, and you made a number of observations as to improper operation, carbon collecting on it, and all of that. You knew of course that Exhibit F is a sand cast piston, don't you? A. It is a sand cast interior, at any rate; and I don't know that it is a sand cast exterior, however.

Q. You don't find those objectionable features as to the blow-bys and collection of carbon, and scoring and so forth, on Exhibit E, the die casting, do you? A. Not to the same extent, the wearing surface is in pretty good shape in Exhibit E.

Q. You don't find the side at the bottom of Exhibit E has collapsed in? A. No.

Q. You don't find hard rubbing opposite the webs, do you? A. No.

Q. What do you think caused that in Exhibit F, the sand cast piston? A. Well, it is a combination of clearance and temperature, has been such that the wall pressure has been high during operation in Exhibit F, and there is no evidence of very high wall pressure in Exhibit E. I have seen many trunk type pistons with no slots at all that have the same kind of surface as Exhibit E. Among other things, it is a matter of how much clearance the piston is given and the effectiveness of the lubrication.

Q. As a matter of fact, the hard rubbing opposite the webs was caused by the fact, really, that the webs expanded out and pushed that cylindrical part against the cylinder, isn't that right? A. Yes. But in order to do that the webs had to become quite hot, or the clearance of the piston had to be relatively small.

Q. What do you say, do you think the webs weren't flexible enough? You have the piston before you, so you

ought to be able to tell something about it? A. No, there is flexibility in the webs.

Q. But still there is this rubbing, apparently due to expansion of the webs outwardly? A. Yes, but as I have mentioned before, that is a matter of the design of the piston and also the clearance with which it is fitted. One can fit the Maynard piston so that it seizes this way or rubs this way. No piston construction is in itself a cure-all against piston troubles. The piston has to be fitted in a certain way. My thought in this was that it was perhaps fitted or intended to be fitted so it would not slap, but it apparently was not fitted loose enough for that particular piston under the conditions of operation.

Q. You made the outright statement that the piston didn't function properly in service. Did you have that piston F in mind or the Long pistons generally? A. No, I had the piston F in mind particularly, and I think I was describing the collapsing of one of the side walls of this piston and the scoring on the thrust faces.

Q. You didn't have the Long pistons generally in mind, did you? A. I don't think I had them generally in mind with that statement, but generally speaking, the Long pistons were not satisfactory.

Q. What do you base that on? A. I base that on my general piston experience and with the information that I have got from time to time with respect to pistons in operation in the United States.

Q. From whom did you get the information with reference to the Long pistons in the Franklin engines? A. I got it from the automotive engineers of the Aluminum Company.

Q. Oh, the automotive engineers of the Aluminum Company? A. Yes.

Q. Of course they were boosting the Long pistons, were they not? A. Oh, they weren't; but they were continually in touch with the Franklin Company and would come back with repeated tales of how they weren't satisfied with their pistons.

Q. And I suppose the Aluminum Company offered the Franklin Company a better piston than the Long pistons? A. Yes, they eventually did.

Q. In 1926? A. Yes, it was earlier than that that they offered th m a better piston.

Q. Why didn't the Franklin Company take a better piston earlier than that? A. Oh, they had quite a period

of testing. I don't know just why they didn't make the change earlier.

Q. Was the Gulick piston offered to them just exactly as shown in the drawings? A. No.

Q. Wasn't the Jardine piston shown to them just as shown in that drawing? A. No.

Q. As a matter of fact it was shown to them just as shown in that drawing, wasn't it? A. Not that I know of.

Q. And don't you know the Franklin Company would not have the Jardine piston? A. No, I didn't.

Q. Do you know whether the Maynard patent piston was offered to the Franklin Company? A. No, I don't know whether it was or not.

Q. And then finally in 1926 the Franklin Company turned over to the strut piston? A. That is correct. In so far as I know, they haven't complained since.

Q. Did you say that the Aluminum Company of America made castings for the Franklin Company from 1920 to 1926 for those Long pistons? A. Well, I don't know the exact date, but they made castings for the Franklin Company from about 1920, as I recall it, to about 1926.

Q. And that Long piston was a more expensive piston than either the Jardine or the Maynard piston? A. Yes. They paid, I know, considerably more for their castings than they would have for the others.

Q. And in addition paid Mr. Long a substantial royalty? A. So I understand.

Q. And you can't explain that at all, can you, why the Franklin Company should pay a higher price for the Long pistons and pay Mr. Long a royalty, when the Jardine and the Maynard pistons were available to the Franklin Company for a period of from five to six years? A. No, I really can't explain it.

Q. You cannot offer any explanation at all? A. No. Nor can I offer the explanation why they slotted the bottoms of the skirt of the old Franklin type piston.

Q. But you do gather from all of that that the Long piston was no good, while the Jardine and Maynard patent pistons were far superior? A. The Maynard piston is far superior for general purposes; there is not any question about that. So far as the application in the Franklin car is concerned, I can't say. I do know from my own experience that Franklin was complaining about piston trouble from 1916 until about 1926.

Q. People are still complaining about piston troubles, are they not? A. Not very much. The piston situation is pretty satisfactory today.

Q. As a matter of fact Ford did change over when he started to put out his V-8, didn't he change over to this particular piston, Exhibit 3-J, didn't he? A. Yes, he did, but that was a much smaller piston than the Model A piston, and his V-8 for 1933, I understand, is right back in the direction of the Maynard piston.

Q. And Chrysler in the Plymouth changed over to 3-O? A. That is correct. They have changed over in the Plymouth to a piston like Exhibit 3-O.

Q. But what I want to bring out, there is a continual change in the piston design even today? A. Oh, yes, there is progress being made. This 3-O piston is an advance in the art of aluminum pistons.

Q. You think it is an advance in the art over the Maynard patent? A. Yes, I do, especially for small diameter pistons.

Q. Do you think it is an advance in the art over any of the particular illustrations shown in any of the other patents in suit? A. I think it is, yes. It involves combinations which make it very desirable for small diameter pistons, at any rate.

Q. Now, you said that the Aluminum Company submitted various designs to the Franklin Company. What designs did the Aluminum Company or one of its subsidiaries submit to the Franklin Company? A. Well, I don't know just which ones they did submit, but they submitted the Invar strut design eventually, and they were accepted.

Q. But I understand that your statement was that various designs were submitted to the Franklin Company before the Invar strut was accepted? A. Well, I think they were, yes. Automotive engineers of the Aluminum Company were in contact with the Franklin Company at fairly frequent intervals from say 1916 on to the present time.

Q. They were trying to get pistons, too, weren't they? A. Yes.

Q. And they tried to take, in a perfectly business sense, away, tried to take that piston business away from Long; isn't that right? A. Oh, no, I don't think so.

Q. But I don't mean in any unfair way; I mean just in the natural course of business, tried to get busi-

ness for the Aluminum Company of America. A. They were trying to evolve a piston which was satisfactory both in operation and in cost and in the manufacture, which they finally did.

Q. But you can't tell me what designs were submitted to the Franklin Company? A. No, I can't. But I suspect that they tested a lot of pistons.

Q. Well, was your statement that a number of designs were submitted to the Franklin Company just based on suspicion, or what was it based on? A. Oh, no, it is based on my contact with the Aluminum Company automotive engineers.

Q. But you can't tell me any specific design that was submitted, can you? A. No, I cannot. In fact, I couldn't give you the specific design of the Invar strut piston that they used or that they started to use in 1926.

Q. Well, I am not interested in any details you mention. Can you tell me whether the Jardine piston was ever submitted to them? A. No, I can't.

Q. In other words, after all of your success with the Jardine piston, of the Aluminum Company, you never even submitted it to the Franklin Company? A. I don't know whether it was ever submitted to them.

Q. Can you find out what designs were submitted to the Franklin Company? A. Oh, I think I possibly could, if there is any point about it.

Q. Well, there must have been a point to it because you stated that various designs had been submitted. A. Yes.

Q. And now you can't tell me what designs had been submitted? A. That is correct.

Q. Now, turning to the Hives British patent drawing, you placed dividers across that space in Fig. 2 and you found out that the diameter along the wrist pin axis was greater than at right angles to it; is that right? A. Yes, that is right.

Q. What difference was there? A. Oh, not very much; enough to be readily seen with the sharp point dividers.

Q. You notice in Fig. 2 very distinctly a center mark, don't you, that had the center of a compass? A. No, no, there is no centering mark.

Q. What is that part right there? A. That just happens to be some kind of spot. There is nothing like it over here; there is no hole through the paper.

Q. I don't mean a hole through the paper, but I mean there is a spot right about in the center of that circle. A. Yes, there is a spot.

Q. There is a spot? A. Yes, there seems to be another one a good deal like it off to the side a little ways.

Q. But there is no hole through that paper? A. No.

Q. Now, do you know what process is used in making drawings, of making reproductions like a British patent? A. No.

Q. Well, you know it is a photo-lithographic process, don't you? A. Well, I don't know what process.

Q. Well, you don't think each one of these was separately drawn up in Great Britain with pen and ink, do you? A. In the printed copies?

Q. Yes. A. Oh, no; these copies are printed, of course.

Q. Now, assuming this to be a photographic process, Doctor, if the sheet were held perfectly flat and the camera was 100% O.K., you would get a perfect reproduction? A. Yes.

Q. But if the sheet were held, for instance, concave or convex, that is with the convexity along the vertical line, or the concavity along the vertical line, the reproduction of a perfect circle would show the axis, the horizontal axis larger than the vertical axis, wouldn't it? A. Yes.

Q. And the same might be true, the reverse might be true, if the sheet were concave or convex along a horizontal axis? A. That is correct.

Q. So you wouldn't for one minute say that it was contemplated by the British patentee that the major axis, I mean the axis along the wrist pin bosses, should be greater than the axis at right angles thereto? A. Oh, I wouldn't say that that was necessarily contemplated. I merely pointed it out.

Q. As you read the statement in the specification, page 1, lines 33 to 38, is it your idea that the British patentee contemplated the oval section to be from the line A-A, Fig. 1, downward? A. That is correct.

Q. That is what you read into it? A. Yes.

Q. That wouldn't make it work, would it? A. No, not very well.

(Short recess taken.)

Q. Now, Doctor, as you read that Hives patent, the oval cross section being from the slot A-A down, the

Q. As far as the relief in the region of the wrist pin bosses? A. I had in my mind this type of relief shown here on Fig. 1; horizontal slotting is shown at the separation between the head and the skirt, and this 1d relief is shown extending out and overlapping the horizontal slotting, and of course that gives the skirt an opportunity to deform.

Q. Well, let's stick a little bit to the relief in the region of the wrist pin bosses, and compare Franquist with Mooers in that. A. That is shown also. The relief is shown by this dotted line 1d, Fig. 2, and the relief overlaps the horizontal slotting, as shown at the upper boundary of the relief, which is in part the lower boundary of the horizontal slot.

Q. Oh, I see. I think I get you. In other words, in the Franquist patent this slotting, horizontal slotting, does not go into the relief? A. That is correct.

Q. That is your position on that? A. Yes. I may say that the Mooers effect in the 3-O piston is not as great as it would be in a construction like the Mooers patent, or like the Maynard patent, but the principle of them still operates in the 3-O construction.

Q. Now, let's get each other clear now. It is your position then, that the Mooers patent distinctly shows the feature of having the horizontal slotting go into the relief? A. Yes.

Q. There is no question about that? A. Not as I read the drawing.

Q. And in the Franquist patent the horizontal slotting stops just at the relief? A. Either at or short of the relief.

Q. And in the Ford piston exhibit, Exhibit 3-J, the horizontal slotting does not go into the relief? A. Well, the horizontal slotting goes into the relief very substantially in the Ford 3-J.

Q. But still you don't consider that as having the improvement of the Mooers patent? A. No; because of the vertical slot. If that piston were operated without the vertical slot, then the Mooers principle would operate.

Q. But as soon as it has the vertical slot, then the Mooers principle ceases to operate? A. Yes. The forces within the piston then can no longer operate to help distort it to conform to the cylinder. The distortion has to take place, or the flexibility, as the result of cylinder wall pressure. Or if the 3-J piston had the horizontal slot on the other thrust face, then it would, to an extent, have the Mooers operation.

Q. And in 3-O it is because the slots don't go to the bottom of the skirt that it embodies the improvement of the Mooers patent? A. That is correct.

Q. In other words, extend the slot to the bottom of the skirt and it does not embody the improvement of the Mooers patent? A. No.

Q. But still you say the other exhibits like BBB and CCC and Exhibit 1 embody the feature of the Mooers patent in there even though the slot does extend to the bottom of the skirt? A. Yes, those all embody the Mooers principle of operation because there is a horizontal separation between the head section and the guide section on one of the thrust faces which is not vertically slotted.

Q. In order to embody the feature of the Mooers patent, it doesn't make any difference how much horizontal separation you have, provided you have some and provided you have that horizontal separation running into a relief; is that your position? A. Oh, my position is that Mooers discloses a principle there which is effective in combination with some of these other features, in helping to reduce clearance in the piston, and when that feature is clearly embodied, then I consider that that is taking advantage of the Mooers principle, and consider Exhibits 1 and BBB and CCC as embodying that principle for the purpose of helping to reduce the overall clearance.

Q. Now, since you have stated your theory, you may be able to answer my question. I ask the reporter to please read the question.

(Reporter reads question, beginning: "In order to embody the feature of the Mooers patent.")

A. No, as I said, I think it must be enough to do some good. I think I included that in my other answer.

Q. You can't tell me just how much the slot would have to run around or how much it would have to run into the relief; you can't tell me that, can you? A. No, I can't tell you that. I think that when a description like this is given and the principle is disclosed, that it must be enough to do some good.

Q. And you just make the statement it does some good, and that is all you want to give? A. Not only some good; it does enough good for people to pay money to use it; that is, to put money into construction and machining to take advantage of it.

Q. Have you tested pistons like Exhibit 3-O? A. No, I have not.

Q. Do you know what its actual construction is? A. Construction?

Q. Yes. A. I think so.

Q. Do you know whether the skirt tapers from top to bottom? A. I think it does not, but I wouldn't be sure of that.

Q. Well, I want to tell you it tapers one and a half thousandths from bottom to top. A. In Exhibit 3-O?

Q. Yes. Now, do you know how much clearance there is on the wrist pin axis? A. No.

Q. You haven't measured that? A. No.

Q. Have you any idea how much clearance there should be in a piston of this kind in order to function so as to embody the improvements of the Mooers and Gulick patents? A. Enough so that when the boss axis wants to expand and pull in the skirt, it is not hindered by pressing against the cylinder wall, with respect to Mooers. I don't think there is any such limitation with respect to Gulick.

Q. Now, your position is that because the slot in 3-O doesn't go to the bottom, it functions like Mooers? A. Yes, in combination with the other features.

Q. And your position is that even though the slot does not go to the bottom, it still functions like Gulick? A. At the top of the skirt, yes.

Q. Now, you said you did not test the pistons Exhibits 3-J or 3-O, or pistons of that construction. Is that true of all of the other accused devices here like Exhibits BBB and CCC, that you haven't made any actual tests on those? A. All the exhibits?

Q. Well, how about BBB and CCC? A. I made no tests on either BBB or CCC.

Q. Your information, then, is again founded on your experience and what you know of pistons in general; is that right? A. Yes, and what I have seen of Exhibits BBB and CCC, and just the hand flexing tests that I have given them.

Q. All right. Now taking Exhibits 72-A and 72-B, you said you performed some bath-room tests on that piston. What were they? A. I said I performed some tests on some bath-room scales. I took the skirt part of this piston, Exhibit 72-B and put it on the platform of some bath-room scales and pressed downward until the slot closed at the bottom of the skirt. I noted the dial reading, which gave me the number of pounds pressure necessary to close the skirt at the bottom with the skirt detached. Then I took another piston of the same kind,

except with the head integrally attached to the skirt, a piston in fact like Plaintiffs' Exhibit 1, and stood on the side of it while my little daughter watched for the point when the bottom of the slot was closed. And I found it took practically my full weight to do that, so, taking the ratios of the two forces, my estimate was that the bottom of the skirt in a piston like Exhibit 1 is fifteen times stiffer than the bottom of the skirt when the skirt is detached from the piston.

Q. You knew that without making that test, didn't you? A. No, it was quite a surprise to me, and it was quite a surprise to the automotive engineers that have been working with these pistons for years.

Q. You mean to say that a head split is easy to close? A. Oh, I knew it would be less, but I had no idea it would be fifteen times, 15 to 1, and that is 15 to 1 in the most flexible part. The ratio becomes steadily higher as the top of the skirt is approached.

Q. You would expect that, wouldn't you? The skirt is attached to the head? A. Oh, yes, I would expect that.

Q. So that it would be practically immovable at the top? A. I don't know what you mean by "practically immovable."

Q. Well, there is very little movement of the skirt at the top where it is attached to the head? A. Well, there is some, of course, enough to be the difference between success and failure in a piston.

Q. And you assume right along that that action takes place in an engine that you have been talking about? A. Yes, I know it does.

Q. You know it does? A. Yes.

Q. Now, do you think that is the sort of action that takes place in the cylinder, a pressure along a diameter? A. That is only one of the many complicated forces.

Q. Well, as a matter of fact there is a diametrical expansion of that piston due to heat along every diameter; that is, at least of the head? A. Yes, that is true. And then the head is very hot, too, as compared with the bottom of the skirt.

Q. And the sides of the piston along the wrist pin bosses are carried out on account of the diametrical expansion along that axis; is that right? A. That is true. There is a force pulling that out, at any rate.

Q. As far as the diametrical expansion of the head along a diameter at right angles to the wrist pin bosses,

that is not applied directly to the skirt? A. No, it is not; not with the horizontal slots.

Q. But the web does expand diametrically, does it not; I mean at least the web does expand with the head, does it not; it is carried out? A. Yes, it has a tendency to do so.

Q. It is carried out along a diameter again, is it not? A. Yes, it has a tendency to do that.

Q. So that the forces that act inside of an engine are not by any means the simple forces that you have when you simply move Exhibit 72-B by pressing along the lines of the wrist pin bosses? A. No, they are not that simple. I thought I had made that quite clear. And I don't believe that any one has ever made quantitative analysis of the forces in a piston, and if they did so at one temperature or under one set of conditions, they would have an infinite set of conditions different from that one set to take into consideration. So that the forces tending to expand the skirt and expand the head and distort, and so forth, are very complicated. Not only that, the properties of the material change with temperature, even the modulate of elasticity of the material is less at the higher temperature than it is at a lower temperature. So you have a continuing differing stiffness of the metal itself from the head down to the bottom of the skirt. So that all those things combine to make the forces both inside the piston and the forces exerted by the wall against the piston extremely complicated and extremely variable.

Q. You didn't try Exhibit 72-B with a wrist pin inside, did you? A. No.

Q. That wrist pin doesn't have a slot in it, does it? A. At the higher temperatures when the flexing is necessary the fit is fairly loose in the wrist pin. In fact, a little too loose to suit the automotive engineers. In order to make the fit proper so that the wrist pin will not seize at sub-zero temperatures, the clearance of the wrist pin is, as I say, quite a bit when the piston is hot, and it is only when the piston is hot that the flexing is needed.

Q. In demonstrating 72-A to the Court, you flexed these little thin skirt parts; you actually flexed them in, didn't you? A. Yes.

Q. That doesn't really happen unless you have a bump of the cylinder, this flexing in like you demonstrated to the judge, that doesn't happen in the cylinder, does it? A. Why, that would happen as the result of the pressure of the skirt against the cylinder wall, yes.

Q. You want the Court to understand then, where you have a cylindrical wall engaged by a cylindrical skirt, that there is an actual pushing in of these little pieces at the end? A. Yes, I think that is correct. The force is not necessarily the greatest right at the slot to produce that flexing in; the force is extended over the whole of the bearing area.

Q. Over the entire bearing area, isn't that right? A. Yes.

Q. And in order to get any movement at all, you have got to get a movement of one cylinder, cylindrical surface, with respect to each other as a whole, don't you? A. Yes; they will do that.

Q. If there is a bearing all around, the initial movement must be the same at the ends of the cylindrical part as at the center? A. Well, there are other movements going on simultaneously, so that, again, it is an extremely complicated action. It is not a simple lever action.

Q. Now, when you took Exhibit 1 and you put the micrometers on it and then you flexed it in at the bottom of the skirt, closed that slot or closed it as much as you could with your hands, you got a sort of leverage action on this part that we can call the web, where the wrist pin bosses are; isn't that right? A. Yes, that is correct.

Q. In other words, the force acts sort of diagonally on that web instead of a straight flexure from along lines parallel with the head of the piston along the webs just below the head? A. Well, I don't know just how it acts. That again, is quite complicated. The uneven section of the skirt and the nature of the skirt between the head and the skirt, all combine to make that a fairly complex action.

Q. But you still want the Court to understand that the very small part from the head where the web connects with the head to where it goes into the cylindrical part of the skirt, that is, this corner, that will actually flex in operation, this short little arm? A. You seem to be very much disturbed about the flexing of some particular little spot in the piston. Now I have said that this web is flexible. It is flexible because it is made of a flexible metal; it is flexible because the web is made thin; it is flexible because of the horizontal slot; it is flexible because of all these relationships; and I have demonstrated that it does flex in response to a force which I can apply with one of my hands on the piston, and the

answer that I make is that that portion of Exhibit 1 is flexible enough to function satisfactorily in the motor in combination with the other elements in that piston.

Q. You understand by "that portion," you mean this little part at the top of the slot just about 1/8" long? A. No, I am not pinning it down to any little part, Mr. Bruninga. I don't see how one can pick out any one little part of this piston and make very much of a calculation about it by itself. Taken in connection with all the other elements of the piston, I have demonstrated, both to my satisfaction, and I hope to the satisfaction of others, that that construction has flexibility at the top of the skirt.

Q. But can't you answer my question when I ask you, do you want the Court to understand that in the operation of the piston the part about 1/8" of an inch long flexes? A. Yes, I think it does. I think I have said that a good many times. I think I have got very good grounds for saying it, although I don't know that that itself makes a whole lot of difference, because Maynard doesn't necessarily say that that particular part has got to flex; he gives a construction which operates in a motor and the construction is similar to that construction of Exhibit 1.

Q. I agree with you that Maynard in his patent nowhere states that that part is flexible. But I have reference to the Gulick patent, in which flexibility of web is relied upon, and that is what I had in mind when I asked you that question. A. You mean that the web does not extend into the curved portion in Exhibit 1?

Q. That is what you consider, that it extends into the curved portion? A. Certainly.

Q. Doesn't it extend clean out to the slot, then? A. It may, if one wants to consider it that way; but this particular part is cast in in Exhibit 1.

Q. I understand it then, in Gulick you must consider the web as running from the wrist pin boss clean to the slot 21; is that right? A. No, I wouldn't consider it that way in Gulick.

Q. As a matter of fact in Gulick, when you talk about a web, you are talking about 18 and 17, the connection between the wrist pin boss and the skirt; isn't that right? A. That is correct.

Q. And that is what I was trying to have you apply to Exhibit 1, that same web. Where do you find it in Exhibits 1, 17 and 18? A. I haven't found in Exhibit

1 that this curve on the end is carried to the inside of the piston in the casting; it is even put in the cores; and certainly I should say that that is intended to be considered as the total web; that is, up to the point where the cast-in portion joins the skirt. But I didn't even take advantage of that curve, which makes for more flexibility in my measurements. I put my measuring surfaces right where Mr. Stellman said that the piston was too stiff.

Q. Let's get down now to cases. We are all agreed, I believe, particularly yourself, that where flexibility is necessary is at the top of the skirt? A. That is where it is most necessary, yes.

Q. You don't care much about the bottom of the skirt? A. I don't care very much about it in general, no, because that can be gotten easy by itself, but to get flexibility of the bottom of the skirt in combination with the flexibility at the top of the skirt is no small problem.

Q. It was demonstrated to your satisfaction by the fact that the Plymouth car, as in Exhibit 3-O, that the slot doesn't have to extend to the bottom of the skirt, and that flexibility of the bottom is not important at all? A. Some means of taking care of expansion at the bottom is desirable, and that means is provided in Exhibit 3-O in another way.

Q. By the usual matter of relief? A. No, by the unusual practice of oval grinding and also that has to combine with a certain thinness of the piston wall, and it will be found that Exhibit 3-O has a very thin piston wall at the bottom of the skirt. Those things all have to combine to make Exhibit 3-O function properly even at the bottom of the skirt.

Q. It was quite a distinct problem to design Exhibit 3-O, then, wasn't it? A. I know it was. Exhibit 3-O represents 1932 and 1933 engineering.

Q. Quite a departure from anything that preceded it? A. No, not quite a departure, but improves over anything that had preceded it.

Q. Of course, all within the teachings of the Gulick patent? A. Not all, no, but embodying the teachings of the Gulick patent.

Q. Well, the important thing then is to have the skirt split at the top; that is the important thing, isn't it? A. That is important, yes. All of these infringing devices here have skirts split at the top in combination

with a horizontal separation between the head portion and the skirt portion, and that is important to get flexibility at the top of the skirt.

Q. And you mean the accused infringing devices. Now, in the Gulick patent, splitting of the skirt is supplemented by flexible webs, that splitting of the skirt at the top is supplemented by flexible webs 17 and 18? A. In the Gulick drawing, yes.

Q. When you talk about flexible webs, you must have reference to flexibility of the web at the top? A. Flexibility of the web so that it will permit flexing at the top of the skirt, so that it will permit flexing of the skirt at the top, yes.

Q. And that is what you must have had in mind when you considered Exhibit 1; isn't that right, flexibility of the web at the top? A. Flexibility so that the skirt at the top can flex. It should be obvious that the flexing of the web in Exhibit 1 at points below the horizontal separation will help the flexing at the top of the skirt. Again, showing the complicated nature of the forces.

Q. Now, you found a flexing there of what we will call the web at the top, of in the neighborhood of six thousandths of an inch? A. That amount of flexing is more, I think, than it really did flex. I think the real amount of flexing was more like two or three thousandths.

Q. Then in your opinion a flexing of two or three thousandths of an inch of a structure like Exhibit 1 is sufficient to meet the conditions? A. Oh, yes, that would be ample.

Q. You are sure of that, that the flexing of that amount, two or three thousandths, is enough? A. In this piston Exhibit 1, yes; I am certain of that.

Q. And that is only one slot? A. That is correct. That has other means, however, of compensating for clearance.

Q. If you had four slots, you would only need one fourth that much flexing at four different places? A. Not necessarily.

Q. Well, let's go back to the Franquist patent. Your position is that that skirt is absolutely inflexible, isn't it? A. Oh, no; I said that skirt simulated a trunk type skirt piston. I can't say it is absolutely inflexible, but it is rigid.

Q. Now, the tests you previously performed on it was a diametrical contraction test; isn't that right? A. Yes.

Q. And you performed the same tests on an ordinary trunk type piston; isn't that right? A. Yes.

Q. You would expect those results, wouldn't you? A. No, I didn't; I was very much surprised.

Q. Didn't you know that when you take any hoop, whether split or not, and you start to contract it diametrically, that it doesn't make much difference how many protuberances there are around there on the inside or outside, that it is the weakest part that yields? A. Well, I may not know as much about hoops as I should, but I was surprised to find that that Franquist skirt behaved like a trunk type skirt. I was surprised that I did not observe the flexibility of the skirt that the Franquist patent says there should be.

Q. Now, taking for instance, comparing pistons Exhibits 3-H and 3-Q, you actually found that as far as pressure applied at diametrically opposite points—I am just taking these for illustration—just taking 3-H for illustration—pressure applied at diametrically opposite points caused about the same pressure in these two types? A. Yes, that is correct. The Franquist type, I think, even was a little stiffer.

Q. You would expect that on account of the corrugations? A. Well, I didn't expect it, but it was true.

Q. But you did not apply a circumferential contraction test, for instance, with a pair of clamps like this Exhibit 34; you didn't apply a test like that? A. No, I didn't.

Q. That is nearer to the actual conditions that are encountered in automobile practice than a simple diametrical pressure; isn't that right? A. No, I wouldn't say that it was. It would be in the piston that had a circular cross-section, perhaps.

Q. But take a piston like Exhibit 3-H and applying this clamping device to it, you wouldn't expect me to be able to compress that at all, would you, with my hands? A. No, I would not.

Q. You would not expect that at all, would you? A. No, I would not.

Q. Would you expect me to be able to contract 3-Q? A. I should think so, some.

Q. You would think so? A. Yes.

Q. Now, what is the difference, and what happens? A. The difference is that you have the tremendous pressure put on circumferentially and you get a little flexing in these ribs.

Q. And these slots actually close up a little? A. I should think they would, a little bit.

Q. And when they actually close up a little bit, that means that the circumference of the whole piston has decreased? A. Yes, I should think so, a little bit.

Q. You have never tried it with 3-Q? A. No.

Q. Now, it is your opinion that it doesn't make much difference whether you expand these ribs inwardly or not and increase the length of the slot, that, if anything, will make the piston stiffer? A. Yes, I rather think so; it will be stiffer at least against diametral distortion.

Q. Even as to the closing up of these slots by applying a clamping device to it? A. I don't know how that would affect it; it might make it a little more perceptible, circumferentially.

Q. Well, you haven't tried that out, have you, Doctor? A. No, I haven't tried it.

Q. I want to hand you a piston marked for identification Defendants' Exhibit 5-L. Examine that with reference to 5-Q. Those two constructions look about the same except that the internal ribbing has been increased, don't they? A. Yes.

Q. And except that the wrist pin has been left out of 5-L? A. Yes.

Q. Now, Doctor, I want you to watch me perform a few little experiments. I am going to take a half a dollar and insert it in one of these slots. (Counsel does so.) Now, that is loose at this time, isn't it? Now, put it in first,—let the Master put it in loose. (Half dollar is put in and Mr. Brumfuga applies pressure with clamping device.) You find that tight, don't you? (Referring to half dollar being held in slot.) A. I find evidence of a little flexing, yes.

Q. But that means I have actually contracted that piston circumferentially; isn't that right? A. I suspect so, although I would like to get the measurements all around to make certain of that. And the pressure that you have used is, I would say, twenty times what would be allowable in a motor to produce such a result. You have used a tremendous leverage to get that result.

Q. I suppose that in your demonstration of Exhibit 1, you didn't use a leverage that was much in excess of that used in a motor? A. I don't know what leverage might be obtained in a motor, but I only used the forces that I possess in my right hand, just one hand.

Q. Don't you think with that leverage that you used at the bottom of the slot in Exhibit 1, that that was multiplied say from twenty to fifty times at the bottom? A. Oh, it would multiply some, certainly; but I don't know how much and I don't know how to arrive at any figure to show how much it is, but I would not expect you to be able to flex this piston, Exhibit 5-L, with your hand enough to either see or to tighten a half dollar when put in one of the grooves.

Q. Now, I am going to try each one of the other slots in succession. (Counsel does so, putting half dollar in each of four slots at bottom and then at top of the skirt and applying clamping device after each insertion.) A. I should like to put the micrometers across a section while it is being flexed.

(It was thereupon found that the proper size of micrometer was not available for the piston in question.)

Q. Well, Doctor, just try a scale across here. This is graduated in 64ths of an inch. See if there is a movement there.

(Applying clamping pressure with clamping device.)

The Master: I thought it was visible.

Mr. Bruninga: I will try it along the lines of the wrist pin bosses now. (Counsel does so.)

The Witness: What is needed is two simultaneous diameter measurements; that is, to see whether or not the pressing in on one diameter may not correspond to an expansion in the other diameter. It may even do so on a piston like Exhibit 3-H, although I can see none on Exhibit 3-H. It is not possible for me to see any movement with a scale on Exhibit 5-L.

Q. But now I have the clamp on the piston again, and I want you to tell me whether you cannot see a distinct movement, slot-closing movement of one of these slots, which is the one having a little nick, the single nick, right near the point where the entrance comes from the outside diameter? A. Yes, I can see a little movement there with the eye.

Q. Now, any closing of that slot like was demonstrated by putting coins in those slots, means that there was a circumferential contraction, wasn't there? A. Not necessarily.

Q. Oh, how could a slot in there close, Doctor, without decreasing the circumference? A. There may be an increase in diameter in a direction at right angles to the two supporting ends of the clamping device.

Q. Now, you have previously stated that two thousandths of an inch is sufficient for practical purposes in Exhibit 1, a deflection of two thousandths. A. In combination with the various other elements in Exhibit 1, and if it does not take too much force to produce that two thousandths of an inch deflection. Of course if it should take enough force to make the piston press too tightly against the walls or to score or to rub so that the power would be lessened, then the piston would not function properly.

Q. Now, two thousandths is the thickness of a rather small hair? A. Yes, the average hair.

Q. You can't even see a movement of two thousandths of an inch, can you, with the naked eye? A. I think not.

Q. Would you still think that the Franquist patent piston, the piston disclosed in the Franquist patent 1,152,902 is just plain no good? A. Yes, yes, I still think that.

Q. And you still think that the piston would seize in a cylinder if constructed like Exhibit 5-L, I mean with the ribs just simply expanded inwardly—I don't want to tie you down to any specific construction—and with reliefs in the region of the wrist pin bosses? A. It would either rub too hard against the cylinder wall or it would slap, one of the two; that is my opinion.

Q. You have never taken the trouble to take a set of these Franquist pistons and put them in an engine to determine whether they would actually work? A. I have not, no.

Q. And that is in spite of the fact that a number of suits were pending on that patent? A. Well, I didn't know about that.

Q. Well, you knew at least one, the Simmons suit was pending? A. Well, I made other tests at that time.

Q. But these theoretical tests that you made in a testing machine of simply pressing that Franquist piston diametrically, which I take it was a piston like Exhibit 71-B, satisfied you thoroughly as to its impracticability? A. Why, it satisfied me that it was too stiff to operate properly and to operate the way the patent said it should operate, and I think that the fact that you have come in here with a piston that has grooves some twice as deep as in the drawing shown in the patented construction, is

pretty good evidence that my conclusions were correct there. Furthermore I said it didn't operate like the patents in suit, anyway. It is supposed to operate according to a kind of accordion principle rather than the simple flexing principle of Gulick and the other flexible skirt patents in suit.

Q. You don't see any particular departure between that Exhibit 5-L and the Franquist patent by the mere fact that the depth of those ribs is increased? A. Well, it is a departure from the drawing of the patent and it is a departure from the piston that you brought in here as representative of the patent, and it is different from the standpoint of construction, in that the construction which you brought in last would be a more difficult one to make, to make it economically.

Q. But when you found out that a structure like 71-B did not show up good, you quit right there, didn't you? A. When I found out how stiff the skirt really was, when I found out it wouldn't flex practically, I was satisfied.

Q. And you didn't proceed any further to lengthen out those—or rather deepen out those slotted ribs to see whether you could make it work that way? A. No, we had no infringing devices with those features on.

Q. You didn't have any infringing devices for the simple reason that the patent was about to expire; isn't that right? A. No, if that were a good patent, everybody would be making the pistons now except the licensees of the Cleveland Trust Company, perhaps.

Q. But you didn't look at that patent and read it and re-read it with a view of trying to make that piston operative to suit you, did you? A. Yes. During the time I went over that patent I tried to find all the good in it I could. I was very much disappointed.

Q. And you were consulted before any suit was brought on that patent? A. No.

Q. Against the Simmons Company? A. No, I wasn't consulted before any suit was brought on that patent.

Q. That was the first time you ever looked at that patent after the suit had been brought? A. Yes, it was.

(Short recess taken.)

Q. Of course, your position is, Doctor, that if one side of Exhibit Q, that is, if one of the slots was completely cut through here, then the thing would not work at all; isn't that right, if one of the vertical slots was

cut clear in two? A. Well, it wouldn't work at all, well, no; you would have all the real cylinder wall pressure on the solid part of the skirt right adjacent to the slot, and the thrust face then would be quite flexible.

Q. Flexing that lever arm from one side of the horizontal slot to the other? A. That would not be a good construction.

Q. You remember the Hartog patent that we had up on prima facie, that had a construction along that line? A. Oh, not like that, no.

Q. No; but I mean that the skirt was divided to one side of the piston and there was just simply one segment that moves in and out? A. Yes, a long spring, very flexible arrangement.

Q. You didn't consider that good at all? A. No.

Q. You know of course that Mr. Hartog was in interference with Mr. Gulick in the Patent Office—the record shows that? A. Well, I have just heard of the Hartog-Gulick interference, that is all.

Q. You don't know whether any objection was made by the owner of the Gulick patent that the Hartog structure was inoperative and therefore the interference should be dissolved entirely? A. I don't know anything about that.

Q. Now, you made the statement that hundreds of thousands of pistons were made as illustrated in the Maynard patent and without the relief, which is so plainly evident in Exhibit 1 where the cylindrical surface joins the so-called webs—that is what you meant? A. Yes.

Q. That it didn't have those reliefs on it? A. That is right.

Q. And when you said "hundreds of thousands" what did you base your information on? A. On records that I looked at in connection with the Oakland piston and the Maxwell piston.

Q. Did you see any of those pistons installed in any engines? A. No.

Q. You don't know, then, whether they might have filed off or dressed off the parts corresponding to the reliefs in Exhibit 1? A. I don't know exactly. I don't think it would make any difference whether they did or not.

Q. I am not asking you whether it would make any difference. But you don't actually know whether those pistons went into those cylinders in that shape? A. I didn't see them. I saw the drawings, which did not call for any special clearance at that point.

Q. I am again asking you what you know; not what you saw from a drawing. A. I don't know.

Q. You don't actually know whether any of those pistons ran for a hundred miles without the relief? A. Oh, I didn't follow up the tests; but I know it and people know things even that they haven't exactly seen.

Q. But I am asking you now what you know, from a legal standpoint; because the law of evidence, unfortunately being against your views, requires knowledge rather than suspicion or founded upon what somebody else told you.

Mr. Richey: Well, that is not a correct statement of the law under the circumstances.

Q. You don't know now whether any of those pistons were ever used in any engine for any length of time, say a thousand or two thousand miles, without having some sort of relief put in them? A. From the standpoint of actually seeing the pistons and going in the motors and measuring them, and tearing down the motors and looking at them, that is correct.

Q. There is not a single one piston today of the type of Exhibit 1 but what has that relief? A. If you want to call it relief. I think the pistons today all have a smaller bearing surface in some way at the top of the skirt than would be indicated by merely bringing the web out straight.

Q. I believe you said that the Ford Motor Company is not now using pistons like Exhibit 3-J, but more along the lines of Exhibit 1? A. That is correct.

Q. As a matter of fact, in that Ford piston as used today that relief goes almost to a point, doesn't it? A. Yes; not almost to a point, but it goes not very much farther than is in Exhibit 1. That is the bending of the web in there, or relief, or whatever you want to call it; the web is actually cast in there, however.

Q. Well, the relief is just about along the lines of the pencil mark, isn't it; it is about that much in the new Ford piston? A. Yes. The pencil mark is pretty wide. It is more like the pencilling that is now heavily made.

Q. In other words, the top of the relief would be around 5/16" from the vertical slot, around about that? A. I should say so.

Q. That is the way the pencil mark shows? A. I should say so. That applies, as far as I know, only to the new 8.

Q. To the small piston? A. To the small piston, yes.

Q. And that is true on each of the thrust faces? A. Yes, it is, and the piston is slotted on both sides horizontally and it is not cam-ground any more.

Q. Have you a sample of that piston? A. No, I haven't.

Q. Where did you see it? A. At the Aluminum Company plant.

Mr. Bruninga: Since the witness has talked about it, can't counsel produce one?

Mr. Richey: I don't know whether I can or not. I haven't one.

Mr. McCoy: I never saw one before.

Mr. Bruninga: The witness brought it in; I didn't bring it in.

The Witness: Well, it is immaterial, isn't it?

Mr. Bruninga: I don't know whether it is or not. This matter of relief has come up. I believe it is incumbent upon counsel to produce such a piston as can be readily obtained around town.

The Witness: I don't know what you want to do that for.

Mr. Bruninga: You mean—

The Witness: Well, you are just extending this case—

Mr. Bruninga: Are you talking as counsel?

The Witness: Off the record.

Mr. Bruninga: No, let it go on the record.

The Witness: I have four or five things I have been trying to get out now for ten days, and other people are trying to get me to go over to different places to do things, and I certainly should like to get through with this thing.

Mr. Richey: Of course, if I had the piston and it is material, I would produce it; but I haven't the piston. If the Master holds it is material and should be brought in, and the witness will bring it, that is satisfactory to me. But the record shows this whole thing about the relief you are talking about is immaterial.

The Master: I don't know now whether it is or not. If the other side wants to produce it, very well; I don't see why it should be ordered to be produced; that is up to the parties.

Mr. Richey: I have no objection to the witness producing it; I haven't got it. Of course nobody

here has any authority, not even the court, to require the witness to produce a thing.

The Master: I didn't say that.

Mr. Richey: I beg pardon; I didn't mean that. But your Honor probably knows what the rule is and has seen it invoked in other cases of this kind.

Mr. Bruninga: I am going to leave it up to you. If you want to produce it, all right; if not, I move that all the testimony with reference to what Ford is doing now, be stricken out.

Mr. Richey: What part is that?

Mr. Bruninga: All reference to what Ford is now using as distinguished from Exhibit 3-J.

Mr. Richey: What part of the answer?

Mr. Bruninga: On direct and cross, both.

Mr. Richey: What is it you want striken out?

Mr. Bruninga: If it is so immaterial, I ask that it be done. You know well enough what you are going to do; you are going to tell the court later on that Ford changed over after trying something else.

Mr. Richey: All right, we join in the request that the witness produce this piston. Of course he can do what he wants to.

Mr. Bruninga: If the witness doesn't produce it after recess, I am going to move that reference to that Ford piston be stricken out, particularly since it is immaterial.

The Witness: I will get the piston. If there is anything else you want, I wish you would mention it now.

The Master: Anything further?

Mr. Bruninga: No.

(Thereupon adjournment was taken to 1:30 p.m. of the same day.)

(Thereupon at 1:30 p.m., Thursday, March 23, 1933 the trial was resumed.)

RE-DIRECT EXAMINATION by Mr. Richey.

Q. Can you produce the piston that Mr. Bruninga asked for just before lunch, and if so will you do so? A. I produce the piston asked for.

Mr. Richey: I offer it in evidence as Plaintiffs' Exhibit 76.

Mr. Bruninga: Of course I want to save my objection until I find out what the witness knows about this piston.

Q. You have been asked during your cross examination a lot about the alleged relief at the ends of the webs in Plaintiffs' Exhibit 1. Will you state whether or not that is a relief or an extension of the web, and give your reasons for your answer? A. I would consider the portion of the skirt in Plaintiffs' Exhibit 1 near and at the top of the piston on which evidence of grinding is present, to be the skirt portion proper, and the remainder of the top portion of the piston below the head section, to consist of webs. These portions are cast into the piston and have counterparts of the depression on the outside of the piston wall in projections in the inside of the piston wall. It appears to me that the webs may be considered as the parts extending up to the portion of the outer wall of the piston which has been machined.

Q. How long has the Aluminum Company of America marketed pistons like that Plaintiffs' Exhibit 1? A. With the bent-in webs, do you mean?

Q. Yes. A. I couldn't say exactly, but I should say with that construction or its equivalent since, say, 1923 or 1924.

Q. Do you know whether or not that same kind of piston has been marketed and sold by any other licensees of the Cleveland Trust Company? A. Yes.

Q. Which others? A. The Bohn Aluminum & Brass Company.

Q. Any others to your knowledge? A. Also the Aluminum Industries, which I understand is a licensee of the Aluminum Company of America.

Q. Now, will you state whether or not any or all of these licensees were making that kind of piston before the Sterling Products Corporation began the manufacture of it, if you know?

Mr. Bruninga: That is immaterial, your Honor. The Sterling Products Company is not involved here at the present time. If you restrict it to the parties—

The Master: What do you claim for that question?

Mr. Richey: Well, we claim that the manufacture of these pistons duplicated the commercial piston of the licensees of The Cleveland Trust Company, followed in their footsteps.

Mr. Bruninga: In addition, I believe it should be brought out that that witness knows about this, not just guessing.

The Master: I think he may answer and you may have your exception.

A. The Bohn Aluminum & Brass Corporation was, to the best of my knowledge. I don't recall of seeing the particular pistons manufactured by Aluminum Industries of this particular type.

Q. What about the Aluminum Company of America? A. Oh, the Aluminum Company of America was, to the best of my knowledge.

Q. Now, you were asked about the flexion of these webs, particularly with respect to length and thickness of web. Will you state what if any relation there is between flexion and thickness, and also between flexion and length? A. Yes, the other variables being the same, the flexibility of a web would be directly proportional to its length. But the relationship between the thickness of web and flexibility is not a direct proportion; that relationship varies as to cube of the thickness. That is, if a web is doubled in thickness, it will be eight times as stiff; and if it is halved in thickness, it will be only one-eighth as stiff.

Q. You were asked about your knowledge of manufacture of and use of pistons like those shown in the Maynard patent with straight webs or without what Mr. Bruninga has called "relief" at the ends of the webs. Will you state whether or not you have yourself seen any commercial pistons of the Maynard type without that so-called relief? A. I have.

Q. And where and to what extent? A. I have seen many of those pistons in the laboratories of the Aluminum Company and in the Aluminum Company plant.

Q. Under what conditions did you see them in the plant? A. I have seen the pistons before they have been put in the motors and I have seen them after they have been put in motors and taken out again.

Q. Now, in this piston business, the car or engine manufacturer furnishes the drawings to the Aluminum Company, for example, or whoever makes the piston casting, don't they? A. Yes.

Q. That is the practice, is it? A. Yes, either that or they accept a drawing proposed by the Aluminum Company.

Q. And that drawing being furnished to the manufacturer of the castings, what does the manufacturer of the casting do? A. He designs a piston casting in such a way that when it is machined, it will correspond with the customer's approved drawing.

Q. And what is the custom as to manufacturing or machining the castings with respect to the drawing? A. The custom is to machine the casting to the drawing.

Q. And if there are any changes made in the casting that are not shown in the drawing, what is the custom? A. The custom is to incorporate the change in the drawing.

Q. And then what was done with respect to the manufacture of future castings? A. The future castings would correspond with the changed drawing until some other change is incorporated.

Q. I have concluded as the result of the questions that were asked that our adversary might contend that some of these corners at the ends of the webs in some of these pistons you said were made after the Maynard patent might be filed off. Would you state whether or not it would be feasible to do that, particularly in such large quantities as you said those pistons had been made and used? A. No, that would be very improbable in a manufacturer's plant.

Q. Why would it be improbable? A. Because it would be necessary, to reduce the cost of machining the pistons, to make the operation standard and incorporate it in the construction, rather than endure the extra cost of hand-filing of any part of the piston.

Q. During your cross examination you were shown this model 5-L, Franquist type of piston, Defendants' Exhibit 5-L. Would you compare that in construction, mode of operation, and results, with the pistons of the patents in suit?

Mr. Brunings: I forgot to offer in evidence that particular piston, Defendants' Exhibit 5-L. I now offer it in evidence.

The Master: It may be received.

A. My comparison would be substantially the same as the comparison with the previous Franquist piston, Defendants' Exhibit 3-Q. The discussion with reference to the locking of the steel wrist pin, for example, with the set screws and the relationship of the grooves and the horizontal slots, would apply to Exhibit 5-L the same

as to Exhibit 3-Q. The piston does not embody the Schmiedeknecht construction, and I do not believe it could operate like the Moocrs patent in suit. The relief mentioned in the Franquist patent specifies that the section which is to be relieved, is the portion around the bosses indicated, I think, as 14 in the Franquist patent. This would mean that the relief would stop suddenly at the tops of the vertical grooves on either side of the bosses, and consequently, there would not be the opportunity for the piston to function like the Moocrs patent, even if the wrist pin were not locked tightly by set screws in the bosses. The construction is not like any of the other three patents in suit involving flexible skirts, because the other patents all combine horizontal and vertical slotting of the piston skirt to enable the skirt section to flex in response to cylinder wall pressures. The mode of operation of the Franquist piston is also different from that of the flexible skirt patents in suit.

Q. You mean Exhibit 5-L? A. Yes, 5-L. And the result would be different.

Q. You spoke on cross examination about it was not so much the matter of getting this two thousandths contraction but how it was gotten. Will you explain more in detail what you mean by that? A. I said that I thought two thousandths of an inch flexing in the web of Exhibit 1 at the top would be ample to allow that piston to function. That two thousandths of an inch, however, is not on the whole diameter of the piston, but it is on only a portion of the diameter. That makes two thousandths of an inch more potent in compensating for extra expansion than two thousandths of an inch on the whole diameter of the piston. Furthermore, such flexing as there is of the webs at the top in Exhibit 1, co-operates with relief and flexibility of the skirt and possibility of distortion as the result of cylinder wall pressures on the slotted sides, and the Moocrs principle on the unslotted side, to compensate for the extra expansion of piston Exhibit 1. So that the entire compensation does not have to be taken care of by web flexing in Exhibit 1.

Q. State whether or not there is any importance as between the relation of the yielding of the piston and the pressure at which it yields? A. Oh, that is all-important; that is, the compensation for extra expansion as the result of cylinder wall pressure must be gained with moderate wall pressures or the whole object of the piston is defeated. If the wall pressure necessary to produce

the flexing is too great, the power is reduced as a result of this excessive wall pressure or the piston may score or seize, or the cylinder may score. It is essential that the compensation for extra expansion be provided by moderate cylinder wall pressures in order to gain the advantages of the flexible skirt piston.

Q. In other words, the yielding may come too late? A. Yes, it may.

Q. Now, look at these so-called Franquist types of pistons 5-L and 3-Q and the others and compare their point of yielding with that which is necessary to prevent scoring. A. Well, as near as I can judge from all that I have seen and the tests that I have made, the amount of pressure required to produce any substantial or helpful amount of yielding in the skirts of pistons 3-Q and 5-L, would be too great for practical purposes; that is, the piston would bear too hard against the cylinder walls to give a practical result.

Q. Speaking of scoring in this connection, will you look at this Ricardo type piston Exhibit 73, and state what caused the irregularities on one side of one of the slippers? A. Yes, that is a typical case of scoring. That piston opposite the end of one of the webs has been bearing very hard against the cylinder wall. In fact, that degree of scoring would very greatly reduce the power obtainable from a piston operating in a cylinder, and the condition would be unbearable in service.

Q. If the web continued to expand, what would happen? A. The scoring would be still worse.

Q. Up to the point where it would seize? A. Yes.

Q. As shown, it has been so great as to press the metal over into the relieved part, hasn't it? A. Yes; it has exerted a force greater than the elastic limit or yield point of the metal itself.

(Short recess taken.)

Q. Will you next look at the Schoengarth special piston Exhibit 5-K10 and compare that in structure, mode of operation and results, with the piston of the Gulick patent?

(Addressing Mr. Bruninga.) You are only relying on that against Gulick, aren't you?

Mr. Bruninga: Yes.

A. This piston, Defendants' Exhibit 5-K10 has a construction and devices designed to make the skirt section adjustable. It is a rigid construction when ready

to operate, being not substantially different from a trunk type piston. The skirt is designed to be fixed in diameter when the piston is cold and to retain the same relationship between the various parts of the piston as a trunk type piston would when heated. The piston being so constructed, its construction is different from that of Gulick, its mode of operation is not different from the mode of operation of the trunk type piston, whereas the mode of operation of Gulick is one in which the skirt is flexible and is destined to flex during the operation of the piston itself. Because of those features, the mode of operation of Defendants' Exhibit 5-K10 is different from that of Gulick, because also of the differences in construction, and mode of operation, the result of Defendants' Exhibit 5-K10 is different from that of Gulick. It is true that in securing the adjustable feature there is a horizontal separation between the head section and the guide section, and there is a vertical slot in one of the thrust faces connecting the horizontal separation with the bottom of the skirt. These features of the construction, however, do not co-operate with other features in the piston during the operation of the piston. Such flexibility of the skirt as is obtained by the slotting alone, is used only in the first installation of the piston, and then at any future interval in which an adjustment is desired. The skirt is only flexed, therefore, at one or relatively few intervals in its whole lifetime, and the flexing does not co-operate with the other parts of the piston while the piston is in operation in the motor. So far as operation in the motor is concerned, therefore, Defendants' Exhibit 5-K10 might be just as well a trunk type, non-flexible skirt piston.

Q. Would the motor be running when the adjustments are operated there? A. No.

The Master: This one is manually flexible. The other one is automatically flexible?

Mr. Richey: Yes, that is one way of expressing it, of course for entirely different purposes.

Q. You were asked to remeasure one of the parts of the Monokmeier cast iron piston and make a correction on Exhibit 74, which you did? A. Yes, sir.

Q. This correction was in the amount of one-thousandth of an inch. Will you state whether or not that change in dimension would change in any way any of the opinions you have given with respect to the Monokmeier piston or any of the other testimony you have

given with respect to it, except that difference of a thousandth of an inch? A. That difference, by the way, was ten thousandths of an inch.

Mr. Bruninga: I didn't stress that; I just wanted to have these figures appear correct; that is all. I didn't make any point of that at all.

A. The change in the measurement which represents a correction over my previous measurements, does not change my testimony, with one exception: I believe that when the piston, Exhibit 3-V, was new, the top of the guide section would be represented approximately by the lands on either side of the upper narrow ring groove. It is clear, however, from the corrected measurements, that during the later stages of operation of this piston, the whole head has been functioning as part of the guide section; therefore in the later stages of operation of this piston, the guide section has extended to the very top of the head. So the conditions were really worse than I had concluded from my earlier measurements.

Q. This piston, Defendants' Exhibit FFF bears the initials "W. M. L. Co." and the name "Magnalite." Do you know what company that was that had those initials and used that name? A. Yes, that is the Walker M. Levett Company.

Q. So it was the Walker M. Levett Company and the Aluminum Company of America that sold these so-called Long type pistons to Franklin and not Long? A. Yes, that is true with respect to the permanent mold pistons, at any rate.

Q. Now, during your examination you have spoken of the combination of the elements and the co-operation of the elements in these pistons. I wish you would explain what you mean by that. Take, for example, the piston shown in the Maynard patent and that shown in Exhibit 1. A. I had in mind that the various features of the construction of the piston like Exhibit 1 co-operate with one another, all at the same time, to help to produce the beneficial results, that is, with the horizontal slot, the vertical slot, the webs, the difference in diameter between the head and the skirt, may all be operating at the same instant in the piston and each may be modified by the other or at least one may be modified by others in the operation of the piston.

Q. You say "they may be." Will you state whether or not they do as a fact co-operate together? A. Yes, they do.

Q. Where did you get this piston you produced here, Exhibit 76? A. From the piston plant of the Aluminum Company of America at Harvard Avenue, Cleveland.

Q. State whether you know that is a Ford piston, and if so, how do you know it? A. It has the name "Ford" cast on one of the webs. I don't know from first-hand information by being at the Ford plant or from any correspondence or visits that I have had with the Ford Company that this is their piston for the 1933 V-8, but this is the piston that is being manufactured for Ford, at least the castings for such pistons are being manufactured for Ford at Harvard Avenue, and I have every reason to believe that that is the piston which Ford is now using in the 1933 V-8 engine.

Q. Well, that has the Ford trade name on there, hasn't it? A. Yes, it has.

Q. How long has the Aluminum Company been making pistons like that for Ford? A. Only two or three months, to the best of my knowledge.

Q. Was that before or since they made pistons for Ford like Exhibit 3-J? A. That is since.

Mr. Richey: That is all.

Re-Cross Examination by Mr. Bruninga.

Q. You don't actually know that Ford has adopted that piston Exhibit 76, in production? A. Yes, I know it, practically. I know that the Aluminum Company is making pistons like these by the thousands now.

Q. I am asking you though, now, do you know whether Ford has actually adopted that equipment as standard equipment? A. I haven't seen one put into the engine block, or anything of that sort, no, but the way I gather other information of that sort about the automotive industry, I am practically certain that Exhibit 76 is the 1933 Ford V-8 piston.

Q. But you don't know but what Ford is still experimenting with that piston to determine whether it is going to be the standard piston? A. Yes, he is putting them into the cars that he is selling now; I feel pretty certain of that.

Q. You just know that from hearsay? A. If you want to call it that.

Q. We are just asking for your information and not deductions you might draw from what people tell you or what you see. Now you said that the flexibility varied directly as the length, in other words, if the length of

a part is increased to double the length, it would be double the flexibility? A. That depends on what you mean by the length. If it is the length of the web, then you halve the flexibility, other things being the same. If it is the length of the lever arm, then the flexibility is doubled.

Q. And that varies universally as the cube of the thickness, is that your understanding of the theory of mechanics? A. Yes.

Q. That only applies, however, to a simple beam fastened to one end; isn't that right? A. Oh, that applies to beam structures generally that are solid.

Q. That doesn't apply to a complex structure like the web in Exhibit 1, does it? A. Oh, not exactly; that is very complicated, of course.

Q. Now, you said you have seen pistons like Exhibit 1 without that relief that we have been talking about, that is, the relief in the cylindrical part going from the web to the skirt proper. Did you see those pistons after they had run for a while? A. Yes, I have.

Q. And you found out they were down on these corners? A. That was the point of hardest bearing, yes.

Q. And after a while they were down considerably? A. Yes, they could wear quite a bit. Of course any piston wears as it is used in the motor.

Q. But that was the point of greatest wear, the zone of greatest wear? A. Yes.

Q. And there was considerable pressure applied there, wasn't there, to cause that scuffing off or wear, we might say? A. Well, the piston will wear whether it has any pressure other than the thrust pressures. I don't know of any way to keep a piston from wearing in service.

Q. Yes; but that wear that takes place in those regions we are talking about, that was due to considerable pressure applied in those regions? A. Oh, I don't know as you could say "considerable pressure." It shows that the piston was bearing first and eventually hardest at those points.

Q. And that is the reason that the Ford piston, Exhibit 3-J, is cam-ground to avoid that wearing down, initial wearing down? A. Well, not exactly. The cam-grinding there is done to try to obtain more even bearing pressure against the cylinder wall at all times, and so that the piston can be fitted a little closer when new.

Q. Now, you take then, as the length of the web, the distance where the web part of Exhibit 1 at the top

actually joins the head at the top to the cylindrical part of the skirt; isn't that right—you take that as the length of the web? A. I take that as the length of the flexible portion of the web.

Q. Flexible portion of the web? A. Yes.

Q. That is what you take? A. Yes.

Q. Then, I suppose, in Exhibit 76 you would take it again as way up to almost the slot? A. Yes, that web is cast in also in Exhibit 76.

Q. And that is what you consider the length of the web to be, way up into the skirt part? A. That is the length of the flexible portion of the web at its top, yes, I should say so.

Q. But in the Gulick patent you only take the length of the web as the part 17 on the skirt? A. Oh, I should think so; that seems to be the only place for the web to end there in that casting.

Q. Now, as far as the part on the inside of Exhibit 1, which shows a set-off corresponding to that keystone relief, that is really done for the purpose of having thickness of the metal the same in the casting, isn't it? A. Well, not necessarily for that purpose. That corresponds to the relief in the outside of the casting.

Q. That is common practice in stove-molding, isn't it, where you have an ornamental part on the stove, to fix up the pattern so that the ornamental side is relieved at the back? A. I don't know.

Q. You have never seen a stove casting? A. Well, I don't know that much about stove-molding.

Q. Well, from your knowledge of metallurgy and casting, you would consider, if there was such a relief, it was done to keep the thickness of the metal the same? A. Well, not necessarily to keep it the same; I would say it is probably designed to provide the proper relationship between flexibility and the other features in the piston, with a horizontal slot of a certain kind.

Q. Now, when you talk about wall pressure between a piston and a cylinder, you really mean the pressure per square inch, which is usually expressed in pounds per square inch? A. I don't know how it is expressed. I mean the pressure of the piston as it expands out against the cylinder wall or as it is forced against the cylinder wall.

Q. But in an engine where the piston expands and there is wall pressure, there may be moderate wall pressure on a unit of surface and still be considerable pressure against the whole surface; isn't that right? A.

Well, that depends of course on the bearing area. If you had a very large area of bearing, you could have small unit pressure and fairly large total pressure. Again that is assuming that the pressure is pretty evenly distributed over the whole surface.

Q. Do you know what the permissible pressure per square inch between a cylinder and a piston without causing scuffing off, undue wearing down, is? A. No.

Q. Now, in the Long piston, Exhibit F, you found evidences of wearing off the skirt, didn't you? A. Yes.

Q. And you don't have reason to believe that that piston seized? A. No, I think probably that piston did not seize.

Q. That Ricardo piston, Exhibit 73, is a sand-cast piston, as you know, don't you? A. Yes.

Q. And being a sand-cast piston, that aluminum was rather soft, wasn't it? A. Probably softer than the permanent mold piston.

Q. Quite a lot softer than the permanent mold? A. Yes, I think so. I could verify that, I think, in a moment (strikes two pistons together). Yes, it is somewhat softer than Exhibit 1.

Q. And that would permit the scuffing off and wear, wouldn't it, being softer? A. That would make the elastic limit somewhat less and produce that flow of metal a little easier, certainly.

Q. Now, Mr. Richey calls your attention to Exhibit FFF, and he called your attention to the "W. M. L. Co." and "Magnalite" on one side of the piston. Now on the other side of the piston you see "E. C. Long, Detroit," don't you? A. Yes.

Q. You still believe that this particular piston was sold to Franklin direct by Aluminum Company of America, or Walker M. Levett? A. Oh, I don't know about that particular piston in view of that on the other side of the boss, but the Aluminum Company or Levett certainly sold direct to the Franklin Company.

Q. But do you know that Mr. Long also sold pistons direct from Detroit? A. No, I didn't know that.

Q. And you didn't hear Mr. McCoy say that after Long promised to be good and buy all of his castings from the Aluminum Company or other licensees, that the suit against him was dismissed? A. Well, if I heard it I didn't pay any attention to it.

Q. Do you know what years the Aluminum Company of America sold pistons like that Exhibit FFF to the Franklin Company? A. No, not from the records;

just from my recollection of seeing the castings around the plant. It was, according to my recollection some time from about 1920 to about 1926.

Mr. Bruninga: Re-direct examination closed.

Thereupon, the defendants called as a witness in surrebuttal, George P. Dorris, who, being first duly sworn, testified as follows:

Direct Examination by Mr. Bruninga.

Q. What is your name and age? A. George P. Dorris.

Q. Where do you live? A. St. Louis, Mo.

Q. What has been your general education, just give it very briefly? A. High school and general school in Nashville, Tennessee, one year in Vanderbilt University, and from there on up through the gasoline engine business, up to this time.

Q. What has been your experience, very briefly, in gasoline engines in automobiles? A. I built my second engine between 1890 and '92. That was a motor boat proposition, and that was operated for four or five years, and driven around Nashville and from Nashville to Bowling Green, Kentucky, where it was sold. During that time I had the agency for the Foos Gas Engine Company of Springfield, Ohio, and sold a number of engines in southern Tennessee and northern Alabama to operate cotton gins. I did quite a little contracting work in keeping those engines running, and other engines. I kept in close touch with what was going on in the gasoline engine business and in 1893 John L. French and myself spent two weeks in Machinery Hall at the Chicago Worlds Fair, where we paid particular attention to all the gas engines on exhibition there, which were principally of foreign makes, English, German, French and Swiss. In 1895 there was a road race or motor race of motor cars, or horseless carriages held in Chicago and I began to build a horseless carriage at that time, which I had operating in the summer of 1897. That was run around Nashville up to previous to Thanksgiving of 1898, when it was shipped to St. Louis where the St. Louis Motor Carriage Company was organized, of which I was vice president and chief engineer. They began building motor cars at that time, and from 1900 up, we had been fairly successful in the motor car business. In 1903 the partner there, John French, died from an auto-

mobile accident in Pittsburgh, and in 1905 that company was moved to Peoria, Illinois. I resigned at the time and formed a new company at St. Louis known as the Dorris Motor Car Company, and was vice president and president and engineer of that up to 1927, January. I spent two years with the Sterling Products Corporation as sales engineer from January, 1928, until about January, 1930.

Mr. Richey: Just a minute. This seems like it is going to amount to a good deal more than I thought. I think you ought to make your application for leave to take surrebuttal, so we can have a ruling on that.

Mr. Bruninga: There are several matters which came up, and I have the right to rebut. He is stating his qualifications as briefly as possible.

Mr. Richey: I want to enter a general objection to taking any surrebuttal testimony. It has not been shown there has been any improper rebuttal testimony, or any reason for taking surrebuttal.

The Master: I think you may have your objection, and the question can be raised later.

Mr. Richey: Of course if this is an expert, we put Dr. Jeffries on and we thought when he left you were at the end of the case. You didn't say you were going to put another expert on. I would like an adjournment to tomorrow morning so we can have him here.

Mr. Bruninga: He can read it. I am going to put on that other witness; I agreed to have him put on.

Mr. Richey: All right, then, if it is all right for him to read the testimony, very well.

Mr. Bruninga: Oh, yes, yes.

Mr. Richey: However, I don't withdraw my objection to its being improper surrebuttal testimony.

Mr. Bruninga: If you have any cause to reply to Mr. Dorris, you can do that at any time.

Q. Now, this Dorris Motor Company was the manufacturer of the Dorris automobile, isn't that right? A. Yes.

Q. Can you tell me what class that automobile was in with reference to the Packard and the Cadillac and cars of that kind? A. Well, we ranked with them right along.

Q. Would you say it was successful or not a successful car? A. Yes, successful.

Q. Now, you said you were chief engineer of that company? A. Yes.

Q. Until it stopped business in 1927? A. Yes.

Q. Now, what experience have you had with pistons, and I may say if you had any experience with the making of cast iron pistons? A. Why, I designed everything that we used at that time, because there was very little to follow outside of the older stationary engines that were in use at that time.

Q. Did you have any experience with the making of slipper pistons? A. Yes, comparatively recently—1916-1917.

Q. Did you have any experience with the testing of aluminum pistons? A. Some.

Q. While connected with the Dorris Motor Company? A. Yes.

Q. Going back now prior to the year 1914, including particularly the years 1911 and 1914, what kind of tests were given pistons in those days by the Dorris Motor Company? A. We had the practice at that time of pulling an engine by a previously started up engine for a day's time to work the frictional heat out of it, and the next day that was put under gas and it pulled the next succeeding engine and helped take the friction out of it.

Q. Now, you have heard the expression "block test" used. What is the block test of an engine, and particularly with reference to pistons, and what was it in 1911 and 1914? A. It was a limbering up test and included the measurement of power and other essential details.

Q. Was it the practice to run-in the engine then in those days, in 1911 and '12 before it was put in the chassis? A. Oh, yes, some.

Q. Did you have any actual experience yourself in the testing of pistons as distinguished from running them in, for the years 1911 and 1914? A. I devoted most of my time to the development and progress in the performance of the engines and all the details.

Q. Did that include the testing of pistons? A. It did.

Q. Did you have any occasion to test pistons as to whether they would function properly as distinguished from running them in? A. Oh, yes, various troubles.

Q. I want you to keep your testimony right down to 1911 and 1914. How was the test of a piston conducted in 1911 and 1914 to see if it would function prop-

erly—was it put in an automobile or put out on the road, or stationary? A. We used to put them in stationary, usually load them, let them run a few hours, push them up a little and push them up until they would seize and the troubles would show, and at what speed it would perform. After we had arrived at the particular piston we knew just about how much it would stand, and if that was as good as we had up to that time, that was passed, it was O.K.

Q. Was any particular attention paid to clearance in those days? A. Oh, yes, certainly; that was gauged very accurately.

Q. Now, how much of a test was a piston run before it was determined that it would operate satisfactorily in your opinion? A. Oh, if we were going to make a change from one piston to another, we would give it maybe a week's time before we would make a decision, running every day.

Q. Would that be in a stationary test? A. Practically, yes.

Q. Can you tell me about what equivalent in mileage that would be before you would be satisfied with the correctness of the construction? A. I would say around a thousand miles.

Q. Now, there was such a thing as a road test of an automobile? A. Yes.

Q. Was that road test run to particularly test out whether a piston would operate or endure? A. Partly. Principally to limber up all the chassis bearings.

Q. Now, is a piston like a spring or a wheel or a steering gear on an automobile, that you have to test it on the road before you can determine whether it will operate satisfactorily? A. You can get a better answer from the block test because you could keep the heat on continually. You can't do that on the road.

Q. But you cannot run an automobile while it was standing still and just run the engine if you want to test a new steering gear, can you? A. I didn't quite catch that.

Q. Well, when you want to test a new steering gear? A. Oh, we had to go on the road.

Q. And that is also true of a wheel and a spring, is that right? A. Yes.

Q. But did you find that necessary in order to test out a piston, whether it would seize or endure? A. No.

Q. Were you acquainted with engineers of different automobile companies in those years, 1911 and 1914? A. I knew practically all of them.

Q. Did you belong to any engineering society? A. I have been a member of the S. A. E. since 1910.

Q. Did you find in the years 1911 and 1914 the automotive engineers would test out a piston by giving the car a road test or a block test? A. Some of them made both, usually.

Q. When they gave them a road test, was there something else on the car besides the piston that wanted to be tried out? A. Oh, a number of things always.

Q. As far as principle of operation and construction is concerned, does the block test tell you anything as to principle of operation and endurance and proper clearance of a piston, does the block test tell you what you want to know, or is it necessary to make a road test? A. Very considerable.

Q. The block test does? A. Drive them until they would stick, then see where they would stick and then file them off where they showed high pressure.

Q. Now, you have seen Exhibit 48 in this case, haven't you? A. Yes.

Q. And you have heard Mr. Gulick testify as to a block test on that type piston? A. Yes.

Q. Can you tell me whether the block test would show up, whether the principle of operation and the clearance would be correct on the piston that he testified about? A. I think so.

Q. Do you think it was necessary to run a 3000-mile road test in order to determine whether the piston would stick or whether it had enough clearance? A. No, the block test was much more severe than the road test.

Q. In a block test you could run your engine up to almost any speed on the wide open throttle? A. Yes, sir, continously.

Q. Could you do that with a road test? A. No.

Q. Now, you have heard Mr. Gulick testify about this Exhibit 51, this aluminum piston? A. Yes.

Q. Do you consider that a road test was necessary for that as distinguished from a block test? A. I wouldn't consider it as important.

Q. Would you consider that it was necessary to test that out for 4500 miles?

Mr. Richey: Object to it as leading.

A. I would not.

Q. You found that parts of an automobile break after it has been out in service, haven't you? A. Yes.

Q. Is that always due to defect in principle of operation? A. No, mostly straight breaks, unless the part is inherently weak, in such case that is usually stiffened up.

Q. Now, keeping to the years 1911 and 1914, as I understand it, after an engine was finished it was put on and run in at first stationary, is that right? A. Yes.

Q. You first run the engine to be worked in with another engine, is that right? A. That is correct.

Q. And then you followed that up by taking that engine and let that run another engine? A. That is correct.

Q. And that was followed up by putting that engine in a car, isn't that right? A. Yes.

Q. Now, that was done in regular commercial operation, wasn't it? A. That was the routine.

Q. And what was the purpose of the road test on the cars that were in regular production? A. Check adjustments and help to work the friction out of the engine and other parts.

Q. Now, you were in court yesterday and heard Mr. Schoengarth testify, did you? A. Yes, sir.

Q. And have you read the Schoengarth patent that he testified about? A. Yes.

Q. What have you to say about the practicability of that piston as shown in the patent?

Mr. Bishop: I object to that as not proper surrebuttal. He went into that with Mr. Stillman, and has put in his case on that.

Mr. Brundage: No, I am asking this witness to only testify, not from the patent structure, but from what he heard Mr. Schoengarth testify as to the piston that he constructed, that he said he constructed and operated in 1915.

The Master: Same ruling on that.

A. I don't see anything that would keep it from operating.

Q. In your opinion was the piston that Mr. Schoengarth described and which he said he operated in 1915 practical for use in worn cylinders? A. Yes.

Q. Now, some question came up yesterday in the cross-examination of Mr. Schoengarth as to the clearance, and that he didn't have any micrometers at the time. Do you think it was necessary for him to have a micrometer with the adjustable piston that he had? A. No, the situation is about the same as adjusting a crankshaft bearing or any other bearing.

Q. Did you examine Exhibit 5-K10? A. Some.

Q. Well, do you understand the principle of adjustment? A. I think so.

Q. Do you know how the adjustment works? A. Yes, he has a taper head screw fitted into a tapered hole, which is between or in the vertical slot.

Q. Do you consider that principle of operation practical or impractical? A. That will work.

Q. Now, Mr. Schoengarth also testified yesterday that he had made a piston generally as shown in his patent 1,174,092, without the adjustment and with the slot 4 practically vertical, he filed off at the side, dressed it off above the slot 3, that it was between one and a half and two thousandths oversize, and he put it in a cylinder and ran it. Do you think that operation of fitting such a piston was practical? A. Yes.

Q. As he described it, can you tell me whether or not you would consider a piston like that would function in a cylinder? A. Certainly.

Q. What have you to say about any compensation for expansion in such a piston? A. Why, it has two major functions here: one, the segregation of the skirt from the head, which stops direct transmission of heat to that portion of the skirt adjacent to the slot, which naturally forces more heat to be carried out through the rings and lesser degree of total heat transmitted to the skirt; there is also the vertical slots which permit a greater degree of flexing of the skirt and possibly closer fitting, without danger of seizure.

Q. What would have happened if he had not dressed down the part above the slot 3? A. Why, if you drive it under that condition it would have soon scuffed off.

Q. Why would it scuff off without seizing at the skirt or without seizing at that point? A. The temperature would expand it to a greater degree than the skirt would expand it.

Q. Why wouldn't it seize? A. From the ratio of size here, there wasn't sufficient metal to produce serious seizure.

Q. Do you know that from experience or just from theory? A. Yes, we have had the ring lands seize when they weren't relieved enough.

Q. But how about scuffing off of a narrow part, have you had any experience with that? A. Apparently you can heat that to a higher degree of heat on account of the lack of backing or metal to absorb the heat or friction, so that naturally a metal would soften up

with that temperature. When the piston seizes it really melts the surface of the metal, so the heat must be pretty high, and that produces scuffing.

Q. Mr. Schoengarth discussed the fact that he dressed off the sides of the piston in the region of the wrist pin bosses. Do you know whether that was an absolutely new practice in 1915? A. That was a universal practice from the beginning of the gasoline engine. Unless you did that you had no degree of fit at all.

Q. Did you ever do that? A. Had to do it.

Q. How far back? A. Oh, 1900 and up.

Q. If you ran a piston a while in a cylinder and that relief isn't there, what happens? A. It would indicate where the pressure had become higher. If you continued in pushing that piston to more heat and speed, it would naturally scuff and burn and it would be naturally relieved.

Q. As a mechanic, what has been your practice when you found a part fitted too tight? A. Why, we looked for the part that was carrying the high load, and eased it up, just like scraping a bearing.

Q. Now, as far as Mr. Schoengarth talked about relieving the piston that he put in that Sullivan & Cumbe car just above the slot and below the lowest ring land, and which did not have the adjustment, can you tell me whether that was a new thing to do to make the piston of less diameter below the ring land than the skirt? A. I don't think so.

Q. How old do you know that to be? A. Right from the beginning of the horizontal slotting, the time that was first produced.

Q. Are you familiar with the Howe patent? A. Yes, sir.

Q. When did you become familiar with it? A. In 1911, the oil pumping began to be a serious factor on account of increased engine speed and it became necessary to relieve the piston at that point to let the oil flow back into the cylinder. We got this idea from the Continental Motor Company, and later one of Mr. Howe's relatives was around selling licenses on it and we paid $75.00 for the license on that patent.

Q. Do you know what the practice was among other automobile manufacturers? A. They all accepted that as soon as it became generally known.

Q. How early did your company take a license under the Howe patent? A. About 1911.

Q. Can you tell me whether or not that practice was in use or did it come in later? A. The first we knew of it, it come to us through the Continental Motor Company.

Q. What year was that? A. Oh, it might have been 1910.

Q. Did you notice it in the pistons of any other cars? A. Oh, it appeared fairly generally about the same time.

Q. About 1910 or 1911? A. Yes.

Q. Now, Dr. Jeffries talked about the Franquist piston, both on prima facie and on rebuttal. He talked again on rebuttal and then I cross examined him as you heard. Have you read that Franquist patent? A. Yes.

Q. Have you seen these two exhibits 3-Q and 5-L? A. Yes, sir.

Q. You saw the test that was performed this morning? A. Yes, sir.

Q. From your understanding of that patent, from your examination of these two exhibits and from the test, can you tell me whether the skirt of that piston is flexible or is it stiff, too stiff to operate in an engine? A. It has a degree of flexibility.

Q. What in your opinion about whether it will operate in an automobile engine? A. It will.

Q. Do you think it will compensate for any expansion? A. To some extent.

Q. Are you familiar with pistons of the character of Exhibit 1? A. I am.

Q. Will you compare the Franquist piston and Exhibit 1, particularly as to functioning at the top of the skirt? A. Well, it has this same segregation of skirt from the head, practically identical with the No. 1. It has some internal cast ribs that are slotted, which provides a greater length of metal for the skirt for its diameter. It has a feature here which is not described in the patent, which is workable, and that is radial expansion of the head has a tendency to pull out the boss walls, which would automatically, to some degree, pull in the cross walls or side walls, which would help or assist or work in harmony with the intentional resiliency or flexibility of this piston.

Q. Do you base that on a mere theory or experience? A. I have had experience with similar pistons on that same principle except that it didn't have the grooves, it had greater reliefs on the side, carried around a little farther.

Q. Did you ever test a piston like Exhibit 1? A. Yes.

Q. Did you find it very flexible at the top of the skirt? A. Not very much so.

Q. Do you consider Exhibit 1 more flexible or less flexible than the skirt of the Franquist patent? A. I would—I couldn't say on that positive, but my opinion would be they wouldn't be far apart on that, especially if the Franquist had about the same amount of metal in it as the number 1.

Q. Now, when those slots, when those slots were partially closed this morning by the test that was given them of clamping in the slot, what happened, did it increase or decrease? A. That shortened the circumference and consequently reduced the diameter.

Q. Dr. Jeffries also brought up on prima facie, and again on rebuttal, this Kant Shore piston, Exhibit 3-Z. What do you know about that piston so far as commercial use is concerned?

Mr. Richey: Objected to as improper surrebuttal. You went into that in your case in chief, all that we did was answer you.

The Master: Same ruling.

A. Why, this has a segregation principle.

Q. I am not asking you about the construction, I am asking you what you know about its commercial acceptance? A. Well, it was used, had quite a little use but developed breakage.

Q. Was that piston ever sold by anybody that you know? A. By the H. & H. Manufacturing Company of St. Louis, that were engine service men, sold that piston.

Q. On prima facie and again on rebuttal the question of this relief of Exhibit No. 1, adjacent the thrust faces, was brought out. Have you anything to say about that, based again on experience and not on theory?

Mr. Richey: Same objection.

The Master: Same ruling.

A. Why, this particular design developed localized high pressure spots at these upper corners of the cross head shoe, the one with the split, to such an extent that if that was driven above 60 miles per hour or continuously, those would be scuffed down. If they were relieved, which they were automatically, which was done by wear, the space would be increased. In fact, the drag on that piston was such at 65 miles per hour to limit its speed, and on replacing pistons with less expansion or

tension against the cylinder walls the speed was put up to 75 miles per hour, with change of pistons alone.

Q. You mean with that same piston? A. Well, with other design pistons.

Q. Now, did you look at this Exhibit 73, the Ricardo piston? A. Yes, I noticed that.

Q. If the skirt, particularly the wide part, were slit, do you think the webs of that construction would flex? A. It would.

Q. What have you to say as to the flexure of the top, would there be any flexure at the top of those webs, cut as they are? A. In here?

Q. Yes, would there be any flexure of the webs at the top, cut back as they are, as shown in the Exhibit? A. Well, it would be a little better than the No. 1 exhibit on account of the greater depth of slot at that point.

Q. You heard Dr. Jeffries testify of performing certain tests with the pistons on a bathroom scale by standing on them. Did you ever perform any tests on pistons that way? A. No.

Q. Would you ever think of testing a piston that way? A. We always tried to get a mechanical gauge to tell us the truth.

Q. Do you think that is a fair test of any piston, to stand on it on a bathroom scale? A. I wouldn't accept it.

Q. Do you think it would teach you anything at all? A. Not serious.

Q. Now, the Ford piston, Exhibit 3-J. Do you understand that piston? A. I think so.

Q. Now, assuming that it is slotted, or even that it is not slotted, what is the function of that cam-grinding in there? A. Why, it transfers the contact of the working shoe a further distance from the base of the slot, the horizontal slot, and therefore permits a greater degree of, a very much greater degree of flexibility than in the case of No. 1. In other words, the points where they scuff the most have been removed. There is another feature here, that is a circular wall would be better because it would be hinged a greater distance from the vertical slot, which would permit a greater degree of flexibility with the same degree of flexion in the metal, or the elastic flexion of the metal.

Q. Are you familiar with Defendants' Exhibit 3-O, the Plymouth piston? A. Yes.

Q. Did you find any flexible webs in that piston? A. No, no webs in it.

Q. Are you familiar with the Mooers patent 1,402,309? A. Yes.

Q. Do you consider 3-O a copy of that patent? A. I would not.

Q. Do you see any resemblance between them at all? A. Not from a functional point of view, except the partial segregation and nearly full segregation on that piston.

Q. There is nearly full segregation on the Mooers patent? A. Yes.

Q. And how much segregation do you find on the 3-O? A. Between a third and a half, not far off from a third.

Q. Do you think that little slot of part way gives you much segregation as far as heat transference from the head to the skirt is concerned? A. When almost two-thirds of it is a solid connection; it would be in the ratio of the length of slot from the head to the circumference.

Q. What is the function of the vertical slot in that piston? A. That is to permit an expansion joint to take care of the excess expansion of the skirt on account of the heat that is transmitted from the head to the upper end of the skirt.

Q. Can you see any similarity between the Gulick patent and that piston, assuming you have read the Gulick patent? A. Well, this would be considerable less metal in it.

Q. I mean as far as structure is concerned?

Mr. Richey: Let him answer, now.

A. Yes, the Gulick has a continuous segregation and the heat and the thrust is transmitted through two inner walls, and the skirt is carried by the inner walls. I understand that that skirt is split to take care of circumferential expansion.

Q. Do you find the slot going all the way down on 3-O? A. This does not.

Q. What would you call that slot in 3-O? A. Commonly known as a T-slot.

Q. Do you find such a T-slot in the Gulick patent? A. No.

Q. Do you find any flexible webs at all in 3-O?

Mr. Richey: Oh, he has answered that. Don't lead him so much.

Mr. Bruninga: That is not leading.

A. If you distinguish web from skirt, I would say no.

Q. What I am talking about is these webs 17 and 18 of the Gulick patent structure. Do you find those webs in 3-O? A. No.

Q. The bottom of the skirt of 3-O is solid? A. Yes, sir.

Q. Can you tell me whether that has any effect on the operation of 3-O? A. I think it is very beneficial.

Q. In what way? A. Why, in all pistons the real expansion carries with it the skirt, and where the slot is continuous, it has a tendency to pull apart or open up that slot, which is contrary to what you want to do. In this case the lower edge of the skirt is continuous and prevents any opening up of that part, and on account of its being continuous allows the side walls to move out under the radial expansion which automatically will pull in the cross dimension. The upper end of the skirt where it is adjacent to the head is very much stiffer because of its contact and connection with the head, cannot be made quite so flexible, but by virtue of the T-slot construction the piston is made flexible at the upper end and not so flexible at the lower end, and that is the desirable factor that has been sought for some time.

Q. I believe you said that piston had an expansion joint at the top in the slot? A. It can be considered so.

Q. How long to your knowledge have expansion joints been used to take up for heat, not in pistons, but in things in general? A. Ever since I was old enough to recognize temperature in working with metals.

Q. What would happen if you ran the slot all the way around 3-O, as in the Gulick patent structure; would the head stay on or drop off? A. Well, it would almost be off, if not off it would—in this piston it would be off.

Mr. Bruninga: That is all.

Cross Examination by Mr. Richey.

Q. Are you still employed by the Sterling Products Corporation? A. No.

Q. You have been here throughout the trial, assisting Mr. Bruninga? A. Yes.

Q. Is the Sterling Products Corporation paying you for being here?

Mr. Bruninga: I don't see where that has anything to do with the issues in this case. He can ask if his expenses are paid, but the purpose of counsel is obvious.

Mr. Richey: It is just a matter of prejudice, nothing else.

The Master: I think he may answer to that. You are entitled to ask that of any witness, if he is being paid.

Mr. Bruninga: It is all right to ask him if he is being paid, but not who paid him.

The Master: He may answer.

A. I am here at Mr. Bruninga's request.

Q. That doesn't answer my question. Tell me who is paying you for being here? A. Well, Mr. Bruninga; it may come from Sterling, I don't know.

Q. You have been paid already for some of the time you have spent here, haven't you? A. Yes.

Q. Who paid you for that? A. It was paid me by Sterling.

Q. Sterling Products Corporation? A. Yes.

Q. As a matter of fact, although Mr. Bruninga recommended you to come here, your arrangements were made with the Sterling? A. No.

Q. You didn't talk with anybody from the Sterling Products Corporation about coming here to testify? A. Afterwards it was discussed with Mr. Bruninga. He was the one to say whether he wanted me or not.

Q. Also, with employees or officers of the Sterling Products Corporation?

Mr. Bruninga: I raise an objection again. The witness has already said that.

The Master: I think he has answered that.

Mr. Bruninga: He has answered the question and the rest is for obvious purposes. As a matter of fact, the answer should be stricken out.

The Master: Oh, I think he may answer.

Q. You also talked with officers or employees of the Sterling Products Corporation about coming here and testifying in this case, or about this testimony? A. Oh, after Mr. Bruninga called me up, yes, I went up there to get a couple of exhibits.

Q. Now, this piston, Exhibit 1. Sterling Products Corporation manufactured pistons like that while you were there, didn't they? A. Yes.

Q. What year was that? A. Oh, it might have been 1919, I think.

Q. What year? A. No, no,—1920. It might have been 1929, I know they weren't making that when I first went up there.

Q. Before they finally adopted this piston like Exhibit 1 they tried to market several other different kinds of aluminum pistons, didn't they? A. Yes.

Q. One of those pistons had an iron strut in the head, didn't it?

Mr. Bruninga: Same objection.

The Master: Same ruling; he may answer.

A. Yes.

Q. You tested that piston out, did you? A. Yes.

Q. And you finally gave it up, didn't you? A. No.

Q. You haven't made or sold any of them like it, have you? A. Not for the present that I know of.

Q. Not since you adopted the one like Exhibit 1? A. I can't say. They may have sold some, I don't know.

Q. You recommended that piston to Ford, didn't you? A. Yes.

Q. And they tried it out and gave it up?

Mr. Bruninga: I want to make an objection. It is entirely outside of the direct examination; I don't see it has any bearing.

The Master: Go ahead and answer the question.

A. The reason for them giving it up was price.

Q. Well, they gave it up, that is the question? A. Yes.

Q. Now, the Sterling Products Company also tried pistons with other forms of splitting other than that shown in Exhibit 1 before they adopted Exhibit 1? A. That was some time back in 1925—'22, somewhere in there.

Q. And those were given up either at or prior to the time Exhibit 1 was adopted? A. I don't know what success they had with them in that time. I joined them when they made that Invar insert piston.

Q. Did you know that the Aluminum Company or Aluminum Industries, Inc., or the Bohn Aluminum and Brass Company, or any of them, were making pistons like or substantially like Plaintiffs' Exhibit 1 at the time that Sterling Products Corporation adopted that piston? A. I think so.

Q. Had pistons been made by one or more of those companies before that piston was adopted? A. Yes.

Mr. Bruninga: I would like to continue my objection. This is going into the suit against the Sterling Products Corporation.

The Master: He has testified he worked for them, I assume he can be cross examined on that, as to what they were doing.

Mr. Bruninga: That is outside of the issues of this case.

The Master: I understand so, but the question came up in direct and to a limited extent I will permit it now.

Q. When did the Dorris Motor Car Company go out of business? A. In 1927.

Q. What did they do, go into the hands of a receiver? A. Yes.

Q. Back in 1911 you were using a trunk type iron piston? A. Yes.

Q. That was standard production, wasn't it? A. Yes.

Q. At that time. And the pistons you tested and described here were pistons of that type? A. Yes.

Q. And what you were doing in those tests was taking that standard type of piston in a standard car, that was right, wasn't it? A. Yes.

Q. And even in those days you put the cars on the road and ran them a while, didn't you? A. That was part of the tuning up.

Q. How far did you run the cars in the test? A. From 50 to not more than 150 miles, usually a day's run.

Q. And you run them farther than that now? A. Don't run them at all now.

Q. That is, since the aluminum pistons came in Ford doesn't run all the cars on tests at all, does he? A. Practically not.

Q. You had a regular force for testing Dorris cars back in 1911, didn't you? A. Yes.

Q. Did you have your own car back in those days? A. Yes.

Q. And you sometimes ran the company's cars, didn't you? A. Yes.

Q. Did you sometimes test the new equipment on your car or the company's cars? A. Both ways.

Q. That was quite the common practice, wasn't it? A. Yes.

Q. And you ran it a mileage depending on the character of the device under test, didn't you? A. Oh, not necessarily so. I ran the mileage because some one test demanded, and maybe not all the factors. We tried to couple up as many experiments as we could on one car.

We usually had two experimental cars, one of them going practically all day, someone was driving it.

Q. Before you recommended the use of a new device on your car you would have it thoroughly tested out? A. To the extent it would show it a betterment over what we were using.

Q. You leaned on the side of overtesting rather than undertesting? A. Oh, I don't know; we had more or less serious troubles all the way along with pistons seizing.

Q. What I mean is you would rather run it more miles to show it was good than run it less miles? A. That depended on the time we had to push it, to get them out.

Q. Of course when you were busy you would take a chance on undertesting? A. Yes.

Q. Not being busy you took a chance on overtesting rather than undertesting? A. Put them in and broke them, see what would happen to them, if it was in a car where we wanted to shift.

Q. That was true of all parts of the car, not only pistons but lots of things? A. Yes, whole thing tested out together.

Q. With new equipment you were never satisfied with the standard test to break the equipment in, such as road tests made by new cars reported by your testing department? A. Oh, I don't get you exactly on that. You say satisfied?

Q. What I am getting at is this, that if you were trying out new equipment, something you had never used before, a new device, you were never satisfied with just the kind of test you made on standard devices, were you? A. No, we run tests on two cars, as a rule, before it ever got to production, before we got to a position to try it out in production or not.

Q. You say production. What do you mean by production? A. Every day delivery work.

Q. Operations on a new device up until the time you went into production was testing, wasn't it? A. Yes.

Q. What you have said now about 1911 was true of 1914, wasn't it? A. About the same.

Q. And the practice you have described was pretty general, wasn't it? A. Yes.

Q. Equipment that was employed in an engine was as a rule tested inside and outside both, wasn't it? A. Yes.

Q. The breaking of a piston in a motor is quite a serious matter? A. Not always.

Q. It is difficult to get in there and remove it, isn't it? A. Oh, you have to take the head off and take the pan off to get at it.

Q. Sometimes when the piston breaks it ruins the cylinders, don't it? A. Yes.

Q. Now, before you would adopt a piston as standard equipment, you would have to be satisfied it wasn't going to break in the cylinder? A. We would, if there was a danger of that; we would question that very seriously as to whether it would stand up. And the engineers at that time were prejudiced against slotting the iron pistons, and that is what prevented a bigger showing of slots previous to what has been shown here.

Q. That is, they were afraid of these things? A. The weakening of the structure and afraid of breakage.

Q. So they wouldn't adopt any aluminum piston? A. Not aluminum—iron piston.

Q. I mean any iron piston that wouldn't be practically 100% perfect as far as breakage was concerned? A. Oh, yes, they took a chance on lots of things.

Q. I am asking a question about pistons; answer the question. A. Well, if it showed signs of being a betterment of what was used previously, they would give it their consideration.

Q. But a piston had to be more perfect with respect to lack of danger of breaking than other equipment? A. Oh, yes, it was given a front place in the testing, recognized as one of the vital spots of the engine.

Q. It was recognized for a good many years that the iron piston was too heavy, wasn't it? A. Yes.

Q. And also it wasn't as good a conductor of heat as it should have been? A. Yes, that is true.

Q. And it was known, at least from 1911 on, that aluminum was lighter and a better conductor of heat than iron? A. Yes.

Q. And therefore better material for a piston? A. Yes, and that a sand cast piston was poorer and that was held up for some time because of the lack of better bearing, it scuffed freely.

Q. The sand cast? A. The sand cast, and that delayed progress in that direction.

Q. But even after the permanent mold piston came in, those things were recognized, as I said, about the advantages of a piston? A. Oh, yes.

Q. You talked about the piston shown in the Schoengarth patent. Except for the testimony you heard Mr. Schoengarth give, you never heard of that piston being used commercially, did you? A. No.

Q. Now, if that piston was adjustable and locked with a locking washer or nut, as Mr. Schoengarth said, the piston would not flex in use, would it? A. It would only serve one purpose, that is the adjustment; the same as the adjustment of a bearing; there might be a slight amount of flexibility between the adjustment on account of the slot.

Q. How often is it necessary to adjust a piston? A. Oh, formerly about every 20,000 miles.

Q. Now, this piston 5-K10, except for what you heard Mr. Schoengarth testify, you never heard of that piston having been used commercially? A. No, that is new to me.

Q. And that piston would be rigid and non-flexible when the adjusting means were set, wouldn't it? A. Practically the same as a solid skirt piston.

Q. You don't mean to say there would be any flexibility in that, do you? A. Not in this particular example; depends on wall thickness a good deal. It might be assisted by that slot in some degree with lighter walls.

Q. In other words, if you made the walls so light it couldn't be used as a piston, it might flex? A. Oh, no, it would be the same as that Deluxe piston, 3-H.

Q. Were you familiar with this Franquist piston at the time that you were struggling with that Sterling piston before you adopted pistons like Exhibit 1? A. I was not, but Mr. Flamang and Mr. Bowser possibly were.

Q. And that Franquist piston of course was not adopted by them? A. No.

Q. You said you had an experience with pistons similar to the Franquist piston. Just what piston did you mean when you said that? A. It was a trunk type, continuous skirt piston, of light walls and a big rib between the two bosses, and a very large clearance on each side so that the cross-head shoes were comparatively small. The radial expansion of the head of that piston was sufficient to push the end walls out sufficient to pull in the side walls, so that the application of heat actually reduced the diameter of the cross-head section of the piston.

Q. That was a trunk type piston? A. Trunk type piston and no slots in it at all.

Q. What was the name of that piston? A. They didn't give it any name.

Q. When was that piston? A. Sometime between January, 1928, and January, 1930.

Q. Was this when you were with the Sterling Company? A. Yes.

Q. Did you test that piston out? A. Yes.

Q. In the laboratory? A. Yes—no, in the shop and in the car on the road.

Q. For the Sterling Products Corporation? A. Yes.

Q. They didn't adopt that piston, did they? A. Not as yet.

Q. Well, are they still testing it? A. I don't know.

Q. Were they when you left there? A. I couldn't say.

Q. This Spillman piston you talked about, when did the H. & H. Company discontinue the sale of that piston? A. I don't know. Mr. Charley Marien was the one that had the contract for that piston, and the H. & H. Company—he started the H. & H. Company. They have been in business there in St. Louis for quite a long time.

Q. It has been a good many years ago since they discontinued it? A. Oh, 1917—'18—something like that, maybe before.

Q. Who made them, do you know? A. They were made in Cincinnati.

Q. Well, aren't you a little early on that date? A. Maybe so, I wouldn't be positive about that. Anyway, they were offered to us and I never did try out any of them because we were afraid of the breakage factor on them.

Q. Do you remember what year they were offered to you? A. Oh, it might have been '20 or '22.

Q. Where did they break? A. They would break the wings, the ones we had.

Q. They would first collapse before they would break? A. Oh, yes, yes, they would hammer after they got loose, too loose, they took a permanent set is what led to the breakage.

Q. What do you mean by "hammer"? A. Well, after these had been pushed in by lack of strength enough to resist the thrust, the diameter would become small, and then they would set up a terrific hammering, then they would knock the wings off.

Q. You mean by hammering, they would flap in the engine? A. In the engine, yes, cross hammer from the thrust.

Q. I suppose that was an objectionable thing, that hammering there, wasn't it? A. It sure was.

Q. What had to happen when that happened? A. Maybe you needed a new engine.

Q. Well, at least the pistons had to be removed, didn't they? A. Yes.

Q. And why would they sometimes have to have a new engine? A. Well, it might lead to breaking a connecting rod, and that would wind it up. Get loose in there and the head come off the skirt part.

Q. Punch holes in the crankcase and such things as that? A. Yes, sir.

Q. That is what happens when a piston breaks in an engine sometimes, isn't it? A. Oh, the skirt parts, that might break off and fall out of the way of the revolving crankshaft, it may set up a little noise, but it wouldn't be more serious than the actual breaking of the piston, it would be taken out immediately and the noise would give indication that something was wrong, so naturally it was replaced.

Q. Sometimes that would happen and sometimes what you said would happen when the piston would break? A. All kinds of things would happen.

Q. You spoke of the Ricardo piston and talked about one there. You never knew of that piston being used commercially, did you? A. Oh, I read of it in the English motor papers.

Q. I mean of your own knowledge. A. No, I don't know of anybody adopting it. I believe that car Mr. Pomeroy built, that all-aluminum car, used them.

Q. When was that? A. That was quite a long time ago, when Mr. Pomeroy joined the Aluminum Company, I believe.

Q. You mean he used it experimentally in his car? A. Oh, yes, experimentally. It was discussed through the S. A. E. meetings.

(Thereupon adjournment taken to 9:00 A. M. the following day.

At 9:00 A. M., Friday, March 24, 1933, the hearing was resumed.)

Further Cross Examination by Mr. Richey.

Q. Mr. Dorris, did you keep in touch with piston needs and development of pistons while you were employed with the Dorris Company prior to 1920? A. Yes.

Q. Did you ever try out a trunk type aluminum piston in any of your cars? A. I don't remember a trunk type, but a kind of cross-head type.

Q. That is, it had a solid skirt? A. Solid skirt, but segregated that from the head at the two shoes.

Q. And something like that Ricardo piston? A. Closely to that, not exactly.

Q. What was the result of trying that out? A. Why, they would stick up after it would run, like all pistons; they were both too large and too small at the same time.

Q. As a matter of fact you ran one in a car and had to stop the car and take the pistons out on the road? A. I did that four times.

Q. And tried to get them to fit, didn't you? A. Why, apparently there was no room for so-called fitting to correct the real trouble.

Q. And after that test you continued with the iron piston, didn't you? A. Yes.

Q. Now, after this aluminum piston like the Maynard type came on the market, did your company adopt them? A. No.

Q. You know those pistons were generally used, don't you? A. Yes.

Q. This trunk type slipper piston you said was like the Ricardo that you tested out. When you took it out, changed it and put it back, what did you do to it? A. Oh, there was nothing to do to it. I just got disgusted with it. That was what they called a semi-die cast casting, supplied by one of the Aluminum Companies, either here or Detroit or Manitowoc.

Q. You say they stuck up, you mean would seine? A. Yes, would seine.

Q. Did the other engineers at the Dorris Company know about this? A. Oh, yes, sure.

Q. Did you make any changes in that piston or try to make any changes in it to remedy that? A. Not seriously. We depended on the Aluminum Company to give us something that would work.

Q. When was that, do you remember? A. It might have been around 1918 or 1919; it was after the armistice, I believe.

Q. Did you continue to use the iron piston up until your company went into the hands of a receiver? A. In 1927, yes.

Q. I hand you a drawing. Does that show the iron piston that you used? A. It looks like one of them.

Q. How long did you use the piston shown in that drawing? A. Well, I won't say that identical piston, but some of the pistons, from about 1915 to 1927.

Q. Was it used just as shown in this drawing, machined that way? A. I think so. I don't recognize these (indicating).

Q. You refer to the white figure? A. Yes.

Q. As distinguished from the black one? A. Yes.

Mr. Richey: I offer this in evidence as Plaintiffs' Exhibit 79.

Q. Was this your standard equipment, this piston? A. Yes, sir.

Q. What clearance did you allow with this piston? A. We gauged the pistons with a piece of paper two thousandths thick and two inches wide, so it could be pushed through readily by hand.

Q. What clearance did you allow with the slipper type aluminum piston you said you brought out? A. I don't remember exactly; it was about three and a half, possibly, or maybe nearly twice that.

Q. You said you tested the equipment in your automobile and cars of the company that you drove. What type of driving did you do when making those tests? A. Went out to break them up.

Q. You used them in driving across country on Sundays, all that kind of driving we used to do with our families and friends? A. Not always with the family.

Q. Well, I mean sometimes. You sometimes took out your family, sometimes your friends, sometimes other people? A. The shop car.

Q. What do you mean "shop car"? A. The crew of the company used to go over to the Indianapolis races, back and forth, you see, all the time, and then always four or five from the factory there.

Q. And then you sometimes took other people out beside the shop people, didn't you? A. Yes.

Q. And you rode back and forth to work in the car? A. Yes.

Q. And went on errands for the company and yourself in the car? A. Yes.

Mr. Richey: That is all.

Re-Direct Examination by Mr. Bruninga.

Q. Mr. Dorris, the things Mr. Richey just asked you about, and the try-out of the car, was that for the purpose of just simply testing out the pistons or trying

out of the car? A. No, not entirely. We used it as utility work as well as for experimental.

Q. Take for instance a piston like Exhibit 48, how much of a run would have to be made with a piston like that to show it had the right clearance? I mean out on the road or on the block or any place, or any other way you can think of, how much of a run would have to be made to determine? A. Oh, if that was fit to what we would call a decent running piston to give it a little chance to work the friction out of it, if we would open it up within an hour to get the full heat on it, it would continue to show whether it was going to continue to run or not or whether it will seize.

Q. Do you have to run a piston like that for a month before it would seize?

Mr. Richey: I object as improper re-direct examination; I didn't ask him anything about that on cross examination.

Mr. Bruninga: There was cross examination on the method of testing out.

The Master: Oh, he has already answered.

Q. Can you tell me how long a piston has to be run in order to determine whether it incorporates the right principle; I am just taking as an example one like Exhibit 48 and that is all?

Mr. Richey: That is not proper re-direct examination.

Mr. Bruninga: Well, then, limit it to anything, any new piston.

A. I would say in a day's run you would begin to know something about it, whether it was better or worse.

Q. Have you found in your experience that a material defect, that is a defect in a casting for instance of a piston, will show up right away? A. Not necessarily.

Q. But has that anything to do with its principle of operation? A. No.

Q. Or the clearance? A. That is practically independent of the principle.

Q. Mr. Richey asked you about permitting mechanics or shop men to run cars. Was that particularly to test out pistons? A. Oh, no, for limbering up process.

Q. Now, Mr. Richey asked you whether some present day cars, I believe, weren't run right off of the line without any running in of pistons, and I believe you answered yes. Can you tell me what type cars are run right off the line?

Mr. Richey: I object unless he knows of his own knowledge.

Q. Well, only testify what you know of your own knowledge, and don't guess at anything and don't tell me what you heard others say, or if you have seen things laying around, like Dr. Jeffries did; just tell me what you know of your own knowledge and limit it to that. A. The end of the Ford line in the River Rouge plant, they come right off and are driven right off the end of the line. Now, what happens before they got to that point, I don't know.

Q. How about the Chevrolet? A. I don't know about that.

Q. You don't know about the Chevrolet. The Ford car, is that a high-priced car? A. No, I wouldn't say so.

Q. Do you know any cheaper priced car than the Ford? A. It is about he bottom, pretty close to it.

Q. Do you know whether the Ford Company instructs the customers to run that car right off the bat at 50 miles an hour? A. I don't know what the practice is now but a few years back everybody practically requested that the speed be kept down until the car was limbered up thoroughly.

Q. Do you know about what speed? A. Oh, that varied; some of them said 30-40 miles, something like that; some of them pasted stickers on the windshield with that instruction on it.

Q. Was that after 1926 or before 1926, that was the practice? A. Possibly more before than after.

Q. Now, do you know whether cylinders today are simply ground? A. Well, the process is boring to bring them within a few thousandths of size, and then honed for sizing, and polished.

Q. Was that honing process used in 1911 or 1914? A. No.

Q. Now, Mr. Richey examined you about the Kant Skore piston, Exhibit 3-Z. Did you ever use any of those pistons? A. No.

Q. Did you ever see them tried out in an engine? A. No, I can't say that I saw them in the engine. I saw them after they come out.

Q. Do you know of your own knowledge that the piston that you saw had come out of the engine? A. It had the markings on it that indicated.

Q. Are you finished? A. I can't say that I saw it come out of an engine, no. I wasn't working on it.

Q. Again I want you to testify of your own knowledge and not do what Dr. Jeffries did, what he looked at it, from appearance. What do you know of your own knowledge as to that Kant Skore piston having been broken loose that you saw? A. No, I couldn't say that I took it out myself.

Q. What is that? A. I can't say that I took it out of the engine myself.

Q. You were there, you saw one of them that was broke? A. After it came out.

Q. Well, you saw one of them that was broken, is that right? A. Yes.

Q. Do you know that that had actually been used in an engine? A. I think it was; I suppose so.

Q. I am asking you whether you know now? A. No.

Q. Did you ever see any other broken aluminum pistons in your life besides this Kant Skore piston? A. Oh, I have seen a few, not many.

Q. Have you ever seen any like Exhibit 1 that were broken? A. Yes.

Q. Where did you see any of those pistons broken? A. In the Ford laboratory.

Q. In Detroit? A. Not Detroit, Dearborn.

Q. What year was that? A. About 1928.

Q. Now, Mr. Richey asked you about a piston that you had tested in a Dorris car. Was that exactly like Exhibit 73? A. It was very similar except the shoes went straight out square on the ends, and not drilled.

Q. And you obtained that from Aluminum Company of America? A. We obtained the casting from Aluminum Company.

Q. Did you ever try out a piston like that? A. Not exactly like that, no.

Q. When you say "exactly" what do you mean? A. Oh, size, proportion, this piston.

Mr. Richey: Referring to Exhibit 73.

The Witness: 73.

Q. Your company quit business, then, in 1926, is that right? A. The fall of 1926-27.

Q. Can you tell me whether you ever tried out any pistons like Exhibit 1, the Ford type piston? A. Well, at that time we had learned to get fair service out of the iron piston, and the Aluminum Company wanted $800 for a die to try out that piston.

Q. Did you think much of it by looking at it? A. Well, we really expected something better because we

knew something of the working of that piston some time before.

Q. Now, Mr. Richey asked you about a Sterling piston that I believe had been submitted to Ford Company. I don't know whether it was identified or not, but will you describe that piston? A. With the Invar in it?

Q. Yes. I believe that is the one. A. Yes.

Q. Will you describe how that piston was constructed? A. Through the second ring groove, crosswise—

Mr. Richey: Perhaps I have one.

(Mr. Richey produces piston and hands same to witness.)

A. (Continued) Through the second ring groove, crosswise the pin, a slot approximately 3/32 x 1-1/2 was broached, and a piece of Invar steel inserted and riveted through a boss at the center of the piston head. This steel insert was then sized so that it, with a ring concentrically arranged, would exactly fit the bore of the cylinder without appreciable clearance, that is, inside of a thousandths of an inch. The skirt of the piston was oval and tapered—let me see—you might say a flattened corner, that is, it had a major diameter at the top and bottom crossways of the pin and a minor diameter in line with the pin. The diameter at the bottom of the piston skirt was made anywhere from zero to plus three thousandths larger than the cylinder. That was put in the Ford car and with the polish in the cylinders at that time could be driven at top speed the first mile.

Q. What tests were made at the Ford plant of that piston? A. It was about June, 1928.

Q. What kind of tests were made, and testify of your own knowledge and not what you heard? A. The first test, we delivered a set of pistons and Mr. Shelldrake had them run, and we were told to come back in a few days to see what happened to them. We came back, and the pistons were badly scuffed on one side only, and after lining the pistons the way they come out of the engine, it proved that they were scuffed between number one and number two and between number three and number four. We naturally asked what was the matter with the cylinder block, and Jimmy Smith, the test engineer, said "Well, you needn't be worried about that, if you knew the fight those pistons put up." That was followed by delivering four more sets of pistons with circumferential difference in diameter, in average diameter

of 12, 10, 9 and 8 thousandths. In a week or so we were back there again.

Q. Cut that as briefly as you can. A. And tried out the first set, which, after three trials, having lost the water through breakage of hose and leakage and possibly going without water, the pistons performed up to the equal of what Ford had and they were taken out and examined and pronounced O.K. That was followed in succession with the other three sets of pistons. The third set was put up to 75 miles an hour within about three miles of the plant, that is the laboratory.

Q. Now, do you know whether Ford ever gave any orders for those pistons to Sterling? A. The Sterling people delivered better than 250,000 of those pistons.

Q. Do you know whether those pistons were in competition with any other piston at that time, I mean, as far as utility was concerned? A. Principally No. 1 piston.

Q. And you say 200,000 were delivered? A. There were 250,000.

Q. And what happened then? A. Well, Mr. Jend began to demand reduction in price in place of a contract, and meantime Sterling had submitted him two cuts in the price, and they had continued to demand reduction in price, so the Sterling people thought it would be better to withdraw then than drag along until there was nothing in it.

Q. Now, that looks like a steel insert in the piston. What is that made out of? A. It is about 34% nickel and the balance low carbon steel.

Q. What price is that steel? A. We paid 40¢ a pound for it at that time.

Q. Did that have anything to do with the price of the piston? A. When the Ford Company figured up that, I believe it figured $800 a ton, they said they wouldn't pay that for gold.

Q. And how did that piston stand up in comparison with Exhibit 1, if you know, by any test that you know of? A. Why, we never heard any complaints after the first month or so. We had a little trouble with the rib not holding.

Q. I am asking you how it compared with Exhibit 1? A. It performed better.

Mr. Brumfinga: Will counsel in this case admit that the application for patent on this piston that Mr. Dorris has been talking about is involved in an interference proceeding with an application of Jardine, the applicant of the Jardine patent?

Mr. Bruninga: Will Mr. McCoy admit that he was one of the parties to that interference and he filed an application for patent on subject matter common to the Sterling piston?

Mr. McCoy: I also moved to dissolve, because the subject matter of my application was not shown in your application, and said motion was granted by the Patent Office.

Mr. Bruninga: But Mr. McCoy will admit on account of his being involved in that interference that an application of Mr. Jardine was involved in that interference?

Mr. McCoy: I believe so, on entirely different subject matter from that of either of the other applications, because of the broad scope of the claims in the parent application.

Mr. Bruninga: Will counsel admit that that interference between Jardine and Flamang and Bowser is still pending in the Patent Office?

Mr. McCoy: I don't know about that.

Mr. Richey: I don't know anything about it. If you say so, I will admit it, subject to correction if we find it wrong.

Mr. Bruninga: I will say that the interference is still pending; it is now awaiting the testimony stage.

Mr. Richey: Why do we clutter up our record with this? I don't think it has anything to do with this case.

Mr. Bruninga: You cluttered it up; I am simply telling the Judge what the facts are.

Mr. Richey: Nothing about this interference. I move all these comments about this interference be stricken out as having nothing to do with the case.

The Master: Overruled.

Mr. Bruninga: That is all.

Mr. Richey: I offer in evidence as Plaintiffs' Exhibit 80 the Sterling piston that Mr. Dorris has used in his description of the steel strut piston that he employed.

Mr. Bruninga: I want to make a statement. I want it to appear from the record that Mr. Richey has produced that piston and handed it to Mr. Dorris.

Mr. Richey: That is right.

Mr. Bruninga: I am not saying it is not a Sterling piston, but I haven't examined it carefully enough that I can admit it.

Re-Cross Examination by Mr. Richey.

Q. Were you at the Sterling Products when a piston of this type was sent out? A. Yes.

Q. First? A. No.

Q. What test did Ford apply to this piston to your knowledge? A. Dynamometer and road.

Q. How extensive were the road tests? A. Why, I was in the plant off and on an average of one day a week for some time, and they were running several sets, which of course I didn't know where they went or to what extent they were driven.

Q. They were in test cars being run substantially constant for a week or more at least? A. I understood so.

Q. And did they thereafter continue the tests on other sets of these pistons of the same nature before they adopted them? A. There was five sets altogether that went in for tests that I know of.

Q. How long was it from the time they were first submitted to Ford to the time they were adopted? A. Oh, not more than 30 days.

Q. I mean adopted for production? A. About 30 days.

Q. Now, the fact is that this piston, as you say, was tested out by Ford in this manner and then adopted for production purposes, but the first cars that they were put in were those that were sold in the neighborhood of the Dearborn plant, weren't they? A. Yes.

Q. A lot of the things you testified about in your direct examination were things you had been told, weren't they? A. I rode in the machine and was in on all those tests.

Q. The tests at the Ford? A. Except the first test.

Q. At the Ford plant? A. At the Ford plant.

Q. You were in the car and rode in the test? A. Yes.

Q. So you know they were tested over a great many miles, don't you? A. Oh, we would put in 150 miles a day on some of those cars at top speed.

Q. Well, isn't it a fact that during your examination a lot of things you testified to were things that you had heard? A. There might have been a few.

Q. Now, about this piston 80, the fact is that Ford adopted this to a limited extent—250,000 pistons is a few pistons for the Ford Company, isn't it? A. Yes.

Q. They adopted a few of them and then used them alongside of pistons like Exhibit 1? A. Yes.

Q. And then the use of those like Exhibit 80 was discontinued and Ford continued to use those like Exhibit 1? A. Yes, the best I know.

Q. And this black material in the slot in this Exhibit 80 is carbon deposit, isn't it? A. Yes, shows high temperature.

Q. Notwithstanding the fact that Ford did discontinue this Exhibit 80 you considered that an excellent piston, didn't you? A. I do.

Mr. Richey: That is all.

Mr. Richey: What about this exhibit? That is offered in evidence as Plaintiffs' Exhibit 79.

The Master: You examined about it, yes. Now, the hearings are concluded except as to the testimony of Mr. Garland.

Mr. Bruninga: Charles Garland.

The Master: And you are to either stipulate that or fix the date when that testimony can be heard later, so that all of this mass of material is in, and if you want to fix a time now when Mr. Garland can be here—

Mr. Richey: We have to have an opportunity to answer anything he had, if it is going to be left open, some of these Gulick witnesses that were strayed, we haven't been able to get, we may find one of them in the meantime.

Mr. Bruninga: I understand this is surrebuttal on my part.

Mr. Richey: We haven't closed our rebuttal case yet.

Mr. Bruninga: You haven't closed your case yet?

Mr. McCoy: I will offer in evidence Plaintiffs' Exhibit 81, the docket entry, journal entry of Gulick vs. The Packard Motor Car Company, equity No. 19; Plaintiffs' Exhibit 82 is the Amplex receivership statement of February 6, 1914; Plaintiffs' Exhibit 83 is the Amplex receivership journal entry, September term.

(It was thereupon agreed by and between counsel and the Master that adjournment would be taken to Monday, April 10th, at 9:30 A. M., for the taking of the testimony previously referred to; that plaintiffs' brief shall be filed on Monday the 24th of April, 1933; that defendants shall file their brief two weeks thereafter, and that ten days shall be allowed plaintiffs to file reply brief, after which a time for oral argument would be set.)

By Mr. Richey: We were informed prior to April 10, 1933 by Mr. Bruninga that Mr. Charles Garland, whom the defendants expected to call as a witness on April 10, died prior to that date and we accept Mr. Bruninga's statement as correct; and, further, that that is the reason Mr. Garland has not been called by defendants.

Plaintiff offers in evidence as Plaintiffs' Exhibit 84 the judgment of the Law Examiner in Interference No. 49,576 handed down by him on April 4, 1924.

Plaintiff offers in evidence as Plaintiffs' Exhibit 85 a certified copy of the drawings of the Ray E. Day application for patent, Serial No. 611,698 filed on January 10, 1923.

By Mr. Bruninga: Defendants offer in evidence as Defendants' Exhibit 5-M a list of patents issued to Packard Motor Car Company on applications filed between August 1, 1917 and December 1, 1917.

The plaintiff closes its rebuttal case.

The defendants close their surrebuttal case.

The case is submitted.

REPORT OF WILLIAM B. WOODS, SPECIAL MASTER.

(Filed January 27, 1934.)

[Case No. 4045.]

To the Honorable Paul Jones, S. H. West and Geo. P. Hahn, Judges of the District Court of the United States, for the Northern District of Ohio, Eastern Division:

Pursuant to orders made and entered in each of these causes on September 14, 1932, at a term of this court held in the City of Cleveland, said District, the undersigned, Wm. B. Woods, Special Master in Chancery, has proceeded to take and hear the evidence offered by the respective parties and to report his findings of fact and conclusions of law thereon, along with his recommendations concerning the relief demanded and concerning the final disposition of these causes, to this court; therefore,

I, Wm. B. Woods, as Special Master in said causes, do respectfully report that I have proceeded to investigate the matters so referred to me; that I have been attended by the parties and their respective counsel at my office at 1214 Terminal Tower Building, Cleveland, Ohio; that pursuant to said order I proceeded to hear witnesses and counsel, to receive and consider testimony, affidavits, exhibits, and other proofs heretofore filed herein, to examine and consider pleadings, proofs, briefs, arguments and any and all other matters relating to the questions involved or the issues raised in these causes; that I have ruled upon the admissibility of evidence and have preserved all evidence offered for final ruling thereon by the court; that I have observed such tests and experiments as the parties performed, and all sessions have been held within this District and Division of this court; and that I have heard and considered all proofs and arguments pertinent to the issues of law and fact in these causes. Such hearings have been had, arguments of counsel have been had, briefs of counsel have been filed, together with suggested findings of fact and conclusions of law, and upon consideration of the same I find and report as follows:

PLEADINGS AND ISSUES.

The three suits were consolidated for hearing before the Master and are heard upon the same evidence by stipulation. The three suits were filed October 17, 1931,

and are the conventional patent infringement suits upon five patents, involving questions of title, validity and infringement, and are for an injunction and an accounting.

Plaintiff, The Cleveland Trust Company, is the legal owner of the title to all of the patents in suit except the Maynard patent, as to which it appears to have only a half interest. Chrysler Corporation named as co-plaintiff, is owner of the other half of the Maynard patent and is beyond the jurisdiction of the court, and joined as a party plaintiff without its consent. From the evidence it appears that the Trust Company has an option on Chrysler's interest dated prior to the filing of these suits, so that The Cleveland Trust Company is the only party plaintiff before the court.

Defendants are three local dealers of automobile accessories, who have offered for sale, sold and used the pistons charged to infringe, which were made by the Sterling Products Corporation of St. Louis, Missouri, which company is conducting and paying for the defense of the three suits. The Sterling Products Corporation was named in the Bills of Complaint, but on motion was dismissed and its name expunged.

Five patents are involved with a total of eighty-one claims, of which some fifty-two claims are alleged to be infringed. At the outset, only two devices were involved, i.e. a Sterling piston and a Ray Day piston, but as the trial progressed the number of devices claimed to be involved was increased to seven, five Sterling pistons and two Ray Day pistons. The name of the manufacturer, "Sterling" and "Ray Day" are used for convenience.

The subject matter of the patents "relates to pistons" for internal combustion engines as each patent recites, and the following are the patents upon which plaintiff relies:

No.	*Patentee*	*Granted*	*Application*	*Filed*
1,815,733	Gulick	July 21, 1931	204,661	Nov. 30, 1917
1,763,523	Jardine	June 10, 1930	364,997	Mar. 11, 1920
1,655,968	Maynard	Jan. 10, 1928	434,467	Jan. 3, 1921
1,256,265	Schmiedeknecht	Feb. 12, 1918	180,511	July 14, 1917
1,402,309	Moores	Jan. 3, 1922	172,380	June 2, 1917

In each cause the pleadings comprise the bill of complaint and the answer, and there are bills of particulars and several stipulations filed in each cause.

None of the patents in suit have been adjudicated by a District Court, although the applications, particu-

larly of the Gulick patent, have been interference in the Patent Office. A consent decree was also entered in one case involving the Gulick patent.

The Cleveland Trust Company, as trustee, has granted licenses under the patents in suit and pistons involving the inventions of these patents have been made, sold and used in large quantities. A great part of the pistons sold are claimed to be actual or substantial duplicates of the pistons of the Maynard patent. Large sums in royalties have been paid to the trustee under the patents, and these causes seem to be the first real test of the patents.

As was said by Mr. Justice Bradley in *Railway Co. v. Sayles*, 97 U. S. 554 (1878) at p. 556: "The evidence in the case is very voluminous, especially in reference to the question of priority of invention, and would be well calculated to present questions of much embarrassment upon the validity of the patent."

Of a similar situation in the recent aluminum molding case where there were also five patents with 29 claims involved, while here 51 claims of five patents are urged to be infringed, in *Aluminum Company of America v. Sterling Products*, 66 F. (2d) 958 (1933), the Court of Appeals of the 8th Circuit affirmed the Eastern District Court of Missouri and quoted Judge Faris, the trial judge of the District Court, who had said: "The confusing and unnecessary verbosity and prolixity of the patents, the wide range of defenses, the size of the record and the length of the briefs have rendered the case unnecessarily difficult and confusing."

PISTONS, SUBJECT MATTER OF THE SUIT.

The inventions relate to pistons for internal combustion engines. These should be as light as possible and in accordance with accepted construction, pistons are hollow cylinders, closed at one end and open at the other, a connecting rod being secured interiorly by means of a transverse pin. Bearings for the pin are the bosses which project inwardly from the side walls of the piston. The objects of the inventions are to provide a piston which will not expand against the cylinder wall to such an extent as to seize or stick, and at the same time there must be provision for lubrication. A successful and efficient piston is one which prevents the pumping of oil and the freezing due to excessive expansion.

In the present state of the art, pistons are constructed with the head or the cylindrical ring portion having a relatively large clearance with reference to the diameter of the cylinder and a skirt portion more closely fitting the same, which holds the piston in proper alignment and prevents slapping. Pistons must also be so constructed that the oil cannot creep past the skirt and drop back into the cylinder, which results in the formation of carbon.

The difficulty to be overcome is to get a proper fit, for if the piston is of sufficient size to fit the cylinder properly while at maximum temperature, gas and oil will leak by when the piston is cool, as at the starting of the engine. There is also the problem of providing a piston of minimum weight with maximum structural strength.

Large numbers of the pistons are in constant use in automobiles, and one piston is required for each cylinder. Formerly cast iron pistons were generally used and there was little difficulty because of expansion. With the advent of aluminum, making possible a lighter weight piston, a new problem was introduced because of the difference in the coefficients of expansion.

CLAIMS OF PATENTS CHARGED TO BE INFRINGED.

The plaintiff selects to exemplify the inventions of the patents and as the basis of the charge of infringement some 52 claims, so many that the setting of them out in full is omitted. The claims of each patent as applicable to each piston exhibit are of the following claim numbers:

Exhibit CCC (Defendants') Chevrolet "4" Piston.

Gulick Patent, Claims 1, 13, 15, 18, 22, 27, 28, 29, 30, 33, 35, 36, 37, 38, 41, 42 and 43.
Jardine Patent Claims 1, 8 and 10.
Maynard Patent, Claim 6.
Mooers Patent, Claims 3, 4 and 11.

Exhibit BBB (Defendants') Chevrolet "6" Piston.

Gulick Patent, Claims 1, 13, 15, 18, 22, 27, 28, 29, 30, 33, 35, 36, 37, 38, 41, 42 and 43.
Jardine Patent Claims 1, 8 and 10.
Maynard Patent, Claim 6.
Mooers Patent, Claims 1, 2, 3, 4, 6, 10 and 11.

Exhibit 1 (Plaintiff's) Sterling Piston.

Gulick Patent, Claims 1, 11, 12, 13, 15, 18, 30, 33, 35, 38, 41, 42 and 43.
Jardine Patent, Claims 1, 2, 4, 5, 6, 7, 8, 9, 10 and 11.
Maynard Patent, Claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11.
Mooers Patent, Claims 1, 2, 6 and 10.
Schmiedeknecht, Claims 1 and 3.

Exhibit 3-J (Defendants') Ford "8" Piston.

Gulick Patent, Claims 1, 4, 15, 25, 28, 33, 34, 36, 42 and 43.

Exhibit 3-O (Defendants') Plymouth Piston.

Gulick Patent, Claims 1, 4, 15, 25, 33, 36, 42 and 43,
Mooers Patent, Claims 3, 4 and 11.

Exhibit 8 (Plaintiff's) Ray Day Piston, Split.

Gulick Patent, Claims 1, 15, 22, 27, 28, 29, 30, 33, 36, 37, 38, 42 and 43.
Jardine Patent, Claim 1.
Mooers Patent, Claims 3, 4, 8 and 11.

Exhibit 9 (Plaintiff's) Ray Day Piston, Unsplit.

Mooers Patent, Claims 3, 4, 8 and 11.

FINDINGS OF FACT.

(1) That The Cleveland Trust Company, plaintiff, is and was at the time the suits were brought, a corporation of and a citizen and resident of the State of Ohio, having its principal place of business at Cleveland, Ohio, in this District, as alleged in the Bill of Complaint.

(2) That Chrysler Corporation, plaintiff, is and was at the time the suits were brought, a corporation of and a citizen and resident of the State of Michigan, having its principal place of business at Detroit, Michigan, as alleged in the Bill of Complaint, and is not now and was not, at the time suit was brought, within the jurisdiction of this court.

(3) That Sterling Products Corporation is a Missouri corporation, a non-resident of this District and has not been served with process in any of the above-entitled causes, and that the naming of Sterling Products Corporation has heretofore been stricken from the Bills herein by order of this District Court.

(4) That The Schriber-Schroth Company, defendant in Case No. 4045, is and was at the time the suits were brought, a corporation of and a citizen and resident of the State of Ohio and it has and had a regular and established place of business at Cleveland, Ohio, as alleged in the Bill of Complaint.

(5) That The Aberdeen Motor Supply Company, defendant in Case No. 4046, is and was at the time the suits were brought, a corporation of and a citizen and resident of the State of Ohio and it has and had a regular and established place of business at Cleveland, Ohio, as alleged in the Bill of Complaint.

(6) That The F. E. Rowe Sales Company, defendant in Case No. 4047, is and was at the time the suits were brought, a corporation of and a citizen and resident of the State of Ohio, and it has and had a regular and established place of business at Akron, Ohio, as alleged in the Bill of Complaint.

(7) That Sterling Products Corporation was named a defendant in the Bill of Complaint in each of the suits here combined but it has filed no answers; however, its counsel did petition to appear specially to object to any jurisdiction over it in any of these cases, which leave was granted heretofore by the District Court.

(8) That there is no evidence in these causes showing that Sterling Products Corporation has entered its appearance in any of them; or that Sterling Products Corporation controlled the proceedings in these causes to the exclusion of any or all of the defendants, The Schriber-Schroth Co., The Aderdeen Motor Supply Co., or The F. E. Rowe Sales Co.; but that the respective defendants named herein have controlled the proceedings in these causes.

(9) That The Aluminum Company of America has been granted a non-exclusive license under the patents in suit; Bohn Aluminum & Brass Corporation has been granted a non-exclusive license under the patents in suit; and Aluminum Industries, Inc., (formerly The Kant-Skore Piston Company) has been granted a non-exclusive license under the patents in suit.

(10) That Chrysler Corporation holds title to an undivided one-half interest in the Maynard patent in suit and was requested to join in suits as a party plaintiff against Sterling Products Corporation or its customers, and refused, but was not asked to join in any of these particular suits.

(11) That the piston of the Gulick patent embodies the fundamental structure of the Franquist patent No. 1,153,902 and that the piston of the Franquist patent is operative to substantially compensate for expansion; that the piston of the Gulick patent employs essentially the webs of the Spillman & Mooers patent 1,092,870 and of the Chenard & Walcker French patent 468,595 and that the piston of the Spillman & Mooers and of the Chenard & Walcker patents are operative; that the web construction of the Gulick patent differentiates from those of Spillman & Mooers and Chenard & Walcker simply in matter of design involving mechanical skill; and that splitting of the skirts of the Franquist, Spillman & Mooers and Chenard & Walcker patents by through slotting was within the purview of one skilled in the art.

(12) That by admissions of plaintiff's witness, Gulick, Gulick abandoned and had in public use in this country during the year 1911, a piston exemplified by Ex. 48, and during the year 1914, a piston exemplified by Ex. 51; and that by admission of plaintiff's counsel, both pistons embody the subject matter of claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 42 and 43 and Ex. 51 additionally of claim 38.

(13) That the subject matter of claims in issue in addition to claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 38, 42 and 43 differentiates from the Gulick 1911 and 1914 pistons by matters involving mechanical skill.

(14) That the Gulick specification while pending in the Patent Office was broadened beyond the original disclosure while pistons were produced, used and sold by the following parties:

Elmer C. Long
Gustave C. Monckmeier
Walter L. Schoengarth
Albert L. Spillman
Kant-Skore Mfg. Co.
Steven D. Hartog
Frank Jardine
Aluminum Company of America
Howard E. Maynard
Maxwell Motor Co.
Ray Day
William E. Venner

(15) That after the filing of the Gulick application, his application was materially modified, both as to the specification and claims without warrant therefor in the original disclosure.

(16) That the Gulick patent does not describe in sufficient detail to enable one skilled in the art to reproduce the same, the length and thickness of the webs required to secure flexibility.

(17) That the Jardine patent embodies the fundamental structure of Franquist patent No. 1,153,902, that it employs essentially the slipper piston structure of the Ricardo patent No. 1,294,833, and that the splitting of the slippers of the Ricardo patent was within the purview of one skilled in the art.

(18) That the Jardine patent piston differs from the piston of the Long patent 1,872,772 in matters involving mere mechanical skill.

(19) That the Jardine patent piston differs from the piston of the Gulick patent in matters involving mere mechanical skill.

(20) That the Jardine patent does not describe in sufficient detail to enable one skilled in the art to reproduce the same, the length and thickness of the webs required to secure flexibility.

(21) The Maynard patent embodies the fundamental structure of the Franquist patent No. 1,153,902, and that the splitting of the skirt by through and through slotting was within the purview of one skilled in the art.

(22) That the Maynard patent piston differs from the piston of the Jardine patent 1,763,523 in matters involving mere mechanical skill.

(23) That the Maynard patent piston differs from the piston of the Long patent 1,395,441 in matters involving mere mechanical skill.

(24) That the Maynard patent piston differs from the piston of the Gulick patent in matters involving mere mechanical skill.

(25) That the Maynard patent piston differs from the piston of the Schmiedeknecht patent in matters involving mere mechanical skill.

(26) That the Maynard patent piston differs from the piston of the Ricardo patent 1,294,883 in matters involving mere mechanical skill.

(27) That the Maynard patent piston differs from the piston of the Hives patent 140,998 in matters involving mere mechanical skill.

(28) That the Mooers patent embodies the fundamental structure of the Franquist patent No. 1,153,902,

and that the employment of narrow connectors was within the purview of one skilled in the art.

(29) That the Mooers patent piston differs from the piston of the Spillman & Mooers patent No. 1,092,870, in suit in matters involving mere mechanical skill.

(30) That the Mooers patent piston differs from the piston of the Chenard & Walcker patent No. 468,595 in matters involving mere mechanical skill.

(31) That the Mooers patent piston differs from the piston of the Gulick 1911 and 1914 pistons (Exs. 48 and 51) in matters involving mere mechanical skill.

(32) That after the filing of the Mooers application, his application was materially modified both as to specification and claims without warrant therefor in the original disclosure.

(33) That the Schmiedeknecht patent involves the fundamental structure of the Franquist patent No. 1,153,902 or of any trunk piston; that it employs essentially the construction and arrangement of webs and mounting of wrist pin bosses of the Pugh British patent 17,256 of 1907 and the arrangement of the webs of the Ferry British patent 12,772 of 1914; and that the construction of the Schmiedeknecht patent differs from those of Pugh and Ferry patents and from a trunk piston in matters of design involving mere mechanical skill.

(34) That by admissions of plaintiff's witness Gulick he conceived a piston like Exhibit 51 in 1908, but that nothing was done except making sketches until May 1911; that a set of pistons having the construction and mode of operation of Ex. 48 was given a block test in a motorcycle engine in this country in May 1911 and then scrapped; that another set like Ex. 48 was given another block test in an automobile engine for 24 hours in July 1911 and scrapped; that another set of pistons like Ex. 48 was placed in an automobile engine in July 1911 and the engine operated to run in the pistons; that the engine with those pistons was then placed in an automobile belonging to his company and given a road test in July and August, 1911 and that the pistons operated successfully; that thereafter the automobile was used with those pistons in it from July to November, 1911, and scrapped; that each of these tests satisfied Gulick as to the utility of the mode of slotting of those pistons; and that Gulick alleged in his preliminary statement before the Patent Office that the road test in July and

August 1911 was one in which the pistons in said engine were first successfully operated. That no further experimenting was done by Gulick with pistons until May 1914 when he proceeded with the preparation of drawings of a construction like that shown in the application and in July with the construction of the piston of aluminum like Ex. 51; that such piston like Ex. 51 was not given a block test for the reason given by Gulick that he was satisfied with the previous tests as to the success of the slotting; that a set of these pistons like Ex. 51 was placed in an Amplex car, his own property, and the car driven by himself over 5,000 miles from July 16, to November 11, 1914, when the pistons were taken out and permitted to go into the scrap pile and disposed of but that Gulick made no serious effort to regain these pistons. That the test of the 1911 and 1914 pistons was not concealed, but known to various parties and that the automobiles in which they were placed were used like any other automobile, the 1911 car for business of his company and in his own business and in the 1914 car for his personal business.

That in 1911 or 1912 he took a drawing like that of the patent to one Offield, a patent lawyer, and left it with him until 1912 or 1913 when he took it to one Pond, another patent lawyer; that Gulick was not financially embarrassed from 1911 to 1917 sufficiently not to make application for a patent but that in 1913 he raised $600 to put into the Amplex Company and in that period he filed an application on a motor and another application in 1916. That there was no question about the title of the application of the patent in suit being in Gulick. That Packard Motor Company, the intervening titleholder of the application of the patent in suit obtained an option in March, 1916, which was exercised about August, 1917. That neither Gulick nor Packard made any effort to file an application between March, 1916, and November 30, 1917 and that Packard Motor Company, between August 1 and November 16, 1917, filed a number of applications, at least twelve of which were for other than aircraft and motors for aircraft. That no effort was made to place the embodiments of the 1911 and 1914 pistons in the application of the Gulick patent; that no drawing of either was retained; that neither the 1911 nor 1914 pistons were disclosed to Milton Tibbetts, Patent Attorney of Packard Motor Co.; that the 1914 piston did not come to light until November 8, 1922 when Gulick made the sketch, Ex. 33, bearing that date at Cleveland

in preparation for interference and that Gulick did not at that time tell anything about the 1911 piston.

(35) That the Monckmeier pistons, Exs. 3-V and 3-W, were in use by Gustave C. Monckmeier in this country in his automobile for more than two years prior to the Gulick application for patent; that such pistons embodied a T-slot disposed intermediate the wrist pin bosses with the horizontal of the T below the bottom ring land and with the vertical of the T intermediate the bosses; that such T-slotting functioned to compensate for expansion; that any reduction in head diameter to the horizontal slot involved mere mechanical skill; that such use of the Monckmeier pistons more than two years prior to the application of the Gulick patent in suit was open and not in secret but known to others and in fact public; and that the testimony of Monckmeier and his corroborating witnesses is reasonably satisfactory and reliable.

(36) That for more than two years prior to the application of the patent in suit, Walter L. Schoengarth made and sold at Ironwood, Michigan, pistons of the construction shown and described in the Schoengarth patent 1,174,092 but omitting the adjusting device; that such pistons functioned to compensate for expansion; that any reduction of head diameter to circumferential slot was a matter within the purview of a skilled mechanic; and that the Schoengarth pistons were publicly used and sold in this country more than two years prior to Gulick's application for patent. That for more than two years prior to the application of the patent in suit, Walter L. Schoengarth made and sold at Ironwood, Michigan, pistons of the construction shown and described in the Schoengarth patent 1,174,092. That the testimony of Schoengarth is reasonably corroborated, satisfactory and reliable. That the omission of the adjusting devices is within the purview of any skilled mechanic.

(37) That one Elmer C. Long, in March, 1916 exhibited to Louis Stellman and William Venner at Syracuse, New York, a six slotted piston of the construction shown by Exs. Y and A respectively. That six slotted pistons of the construction shown in Exhibit A and also in Exhibit F were sold by Long to Venner while Venner was at South Bend, Indiana, as early as 1917, and that during the year, 1917, Venner sold such pistons as replacements in Franklin automobiles; and

that Venner continued to sell such pistons furnished him by Long and of the construction shown in Exs. E, F and G from 1918 to 1926. That a piston of the construction shown in the Long patent 1,395,441 with a T-slot was tested at Franklin Automobile Co., at Syracuse, New York, July, 1918 as admitted by plaintiff's witness, Burns. That during the year 1918, Elmer C. Long manufactured and sold six-slotted pistons of the construction shown in Exs. E, F, G and R for replacement in automobiles and that such pistons were actually used during the year, 1918 in automobiles; that Long continued the manufacture and sale of such pistons during the year 1919, until the latter part of that year when the manufacture of the same for replacement purposes was sold to one Weems in Quincy, Illinois; and that Weems continued the manufacture and sale of pistons of the construction shown in Exs. E, F, G and R from the latter part of 1919 to 1930, and that the manufacture and sale of such pistons was thereafter then continued by Chadwick. That in March, 1919, a piston of the construction shown in Ex. F was tested by Franklin Automobile Company at Syracuse, New York, and that on the same date a royalty agreement was entered into between Long and Franklin; that as early as April, 1920, Franklin Automobile Company actually furnished such pistons (Ex. F) for servicing of automobiles for replacement purposes; that as early as November 11, 1920, Franklin Automobile Company used such pistons like Ex. E in production as standard equipment; and that Long pistons of the construction of Exs. E, F, G and FFF were used by Franklin Automobile Company in servicing and regular production until 1926. That the Long pistons of 1917-1926 were successful pistons and from 1917 to 1922 were the only commercial pistons which automatically compensated for expansion. That on January 29, 1920, one Gunn, an engineer of Packard Motor Company, then assignee of the application of the Gulick patent in suit described and illustrated the Long piston in "Automotive Industries" of that date (Ex. D-4) and that Packard Motor Company had notice of the Long piston on that date. That as early as July 7, 1921, Weems, then manufacturing and selling Long pistons of the construction shown in Exs. E, F, G and R advertised such pistons in the "Motor Age" of that date (Ex. U). That as early as December 28, 1921, Elmer C. Long, advertised the Long piston of the construction shown in Ex. FFF in "Motor World" of that date (Ex. 5-C).

(38) That defendants' pistons, Ex. 1, BBB, CCC, 3-J, 3-O and 8 do not embody the structure, function and mode of operation of the Gulick patent in suit.

(39) That defendants' pistons, Exs. 1, BBB, CCC and 8 do not embody the structure, function and mode of operation of the Jardine patent in suit.

(40) That defendants' pistons, Exs. 1, BBB, CCC do not embody the structure, function and mode of operation of the Maynard patent in suit.

(41) That defendants' pistons, Exs. 1, BBB, CCC, 3-O, 8 and 9 do not embody the structure, function and mode of operation of the Mooers patent in suit.

(42) That defendants' piston, Ex. 1 does not embody the structure, function and mode of operation of the Schmiedeknecht patent in suit.

(43) That the Gulick patent in suit describes a piston structure in which flexible webs extend from the wrist pin bosses to the skirt and are surrounded by the skirt; that the prior art requires restriction of the patent to the employment of webs which are of sufficient length and thinness to permit flexing of these webs at the top of the skirt; that Ex. 1 does not employ such characteristic webs; that Ex. 8 does not employ such characteristic webs; and that Exs. BBB, CCC, 3-J and 3-O employ no webs at all.

(44) That the Jardine patent in suit describes a piston structure in which flexible webs extend from the wrist pin bosses to the slippers; that the prior art requires restriction of the patent to the employment of webs which are of sufficient lengths and thinness to permit flexing of these webs at the top of the skirt; that Ex. 1 does not embody such characteristic webs; that Ex. 8 does not employ such characteristic webs; and that Exs. BBB and CCC employ no webs at all.

(45) That the Maynard patent in suit describes a piston structure in which automatic compensation is not secured unless the groove E is cut into the webs F sufficiently and beyond the inside of the piston head flange to secure web extensions at the top of sufficient length and thinness to permit flexing of these web extensions at the top of the skirt; that Ex. 1 does not employ such characteristic webs; and that Exs. BBB and CCC employ no webs at all.

(46) That the Mooers patent in suit describes a piston structure having narrow connectors of restricted

cross sections extending from the head flange to the top of the skirt; that the prior art requires such a restriction; that in Exs. 1, BBB, CCC, 3-O, 8 and 9 the connectors are heavy and not of a structure as described in the Mooers patent and that in Exs. 8 and 9 the connectors are from the head to the wrist pin bosses.

(47) That the Schmiedeknecht patent describes a piston structure in which each boss is supported at its ends, with one end of the boss supported from the head and the other end of the boss supported from the web; that the claims in issue are so restricted and must be so restricted by the prior art; and that in Ex. 1 each wrist pin boss is supported intermediate its ends on the web and not as described and claimed in the Schmiedeknecht patent.

(48) That in Ex. 1 automatic compensation is accomplished by what has been termed the "Keystone relief" and not by any web flexibility at the top; that the circumferential slotting terminates at about the inside of the head flange and that such a construction and arrangement does not secure the operation contemplated by the Gulick, Jardine and Maynard patents.

(49) That Ex. 8 relies upon compensation, particularly at the top by twisting of the connectors from the head to the wrist pin bosses and that such construction and arrangement does not secure the mode of operation contemplated by the Gulick and Jardine patents.

(50) That Exs. BBB, CCC, 3-J and 3-O do not employ any webs connecting the head with the skirt and, therefore, no webs of such flexibility as contemplated by the Gulick, Jardine and even Maynard patents, if the latter has such webs having such characteristics.

(51) That defendants' pistons, Exs. 1, BBB, CCC, 3-J, 3-O, 8 and 9 employ the essential structure, function and mode of operation of the prior art, more particularly the Franquist patent No. 1,153,902 and Exs. 8 and 9, also the Chenard & Walcker French patent No. 468,595.

CONCLUSIONS OF LAW.

(1) That The Cleveland Trust Company holds the entire right, title and interest to all of the patents in suit, except the Maynard patent, and as to this patent it holds an undivided one-half of the entire right, title and interest, all as trustee of an expressed trust created by plaintiff's Ex. 26.

(2) That under Equity Rule 37 The Cleveland Trust Company may sue in its own name without joining with it any of the beneficiaries under the expressed trust created by plaintiff's Ex. 26.

(3) That at the time suits were brought, the Aluminum Company of America held, and it now holds, a non-exclusive license from The Cleveland Trust Company under all of the patents in suit.

(4) That the Aluminum Company of America is not a necessary party to these suits.

(5) That Chrysler Corporation is, and was at the time these suits were brought, an indispensable party to the suits and, being outside the jurisdiction of this court, and having refused to voluntarily join as a party plaintiff, it was properly joined as a co-plaintiff without its consent.

(6) That this court has jurisdiction of the several defendants in the three suits, viz., The Schriber-Schroth Co., The Aberdeen Motor Supply Co. and The F. E. Rowe Sales Co.

(7) That this court has no jurisdiction of Sterling Products Corporation, a Missouri corporation.

(8) That this court has no jurisdiction nor power to enter any memorandum or declaratory judgment in the above-entitled causes that said Sterling Products Corporation is estopped by the doctrine of *res adjudicata* in any other suit involving the plaintiffs in the above entitled cause and said Sterling Products Corporation.

(9) That plaintiff, The Cleveland Trust Company, was entitled to acquire the patents in suit.

(10) That by stipulation these three suits were tried together, it being agreed that the evidence adduced in any one of the three causes would be used in any one of the other causes with the same force and effect as if adduced in the cause in which it is used.

(11) That the Gulick patent is invalid and void as to all claims in issue.

(12) That the Gulick patent is invalid and void as to all claims in issue for want of invention.

(13) That the Gulick patent is invalid and void as to claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 38, 42 and 43, because (a) of abandonment—at large—by Gulick and plaintiff and intervening privities in title, and (b) of

public use by Gulick in this country for more than two years prior to his application for patent.

(14) That the Gulick patent is invalid and void as to all claims in issue, additional to those recited in conclusion 13, (a) for want of invention over the pistons abandoned by Gulick and plaintiffs and intervening privities in title for want of invention, and (b) over the pistons in public use by Gulick more than two years prior to his application for patent.

(15) That the Gulick patent is destroyed and invalid in toto, because (a) of the attempt to broaden the original application as against intervening rights, (b) of material changes in the specification and claims after filing, and (c) of failure to describe and claim as required by R. S. Sec. 4888.

(16) That the Gulick patent is invalid and void as to claims 1, 4, 15, 25, 27, 28, 34, 36, 38, 42 and 43, because (a) the subject matter thereof was in public use in this country by Gustave C. Monckmeier more than two years prior to Gulick's application for patent, and (b) the subject matter thereof was in public use and on sale in this country by Walter L. Schoengarth more than two years prior to Gulick's application for patent.

(17) That the Gulick patent is invalid and void as to all claims in issue additional to those recited in conclusion 16, for want of invention over pistons (a) in public use in this country by Gustave C. Monckmeier more than two years prior to Gulick's application for patent, and (b) in public use and on sale in this country by Walter L. Schoengarth more than two years prior to Gulick's application for patent.

(18) That the Jardine patent is invalid and void as to all claims in issue.

(19) That the Jardine patent is invalid and void as to all claims in issue for want of invention over the prior art.

(20) That the Jardine patent is invalid as to all claims in issue because of failure to describe and claim as required by R. S. Sec. 4888.

(21) That the Maynard patent is invalid and void as to all claims in issue.

(22) That the Maynard patent is invalid and void as to all claims in issue for want of invention over the prior art.

(23) That the Maynard patent is invalid as to all claims in issue because of failure to describe and claim as required by R. S. Sec. 4888.

(24) That the Mooers patent is invalid and void as to all claims in issue.

(25) That the Mooers patent is invalid and void as to all claims in issue for want of invention over the prior art.

(26) That the Mooers patent is destroyed and invalid in toto because (a) of the attempt to broaden the original application as against intervening rights, (b) of material changes in the specification and claims after filing, and (c) of failure to describe and claim as required by R. S. Sec. 4888.

(27) That the Schmiedeknecht patent is invalid and void as to all claims in issue.

(28) That the Schmiedeknecht patent is invalid and void as to all claims in issue for want of invention over the prior art.

(29) That the Gulick 1911 piston, Ex. 48 was abandoned to the public by Gulick, plaintiff and intervening privities in title.

(30) That the Gulick 1914 piston, Ex. 51 was abandoned to the public by Gulick, plaintiff and intervening privities in title.

(31) That the Gulick 1911 piston, Ex. 48, was in public use in this country by Gulick for more than two years prior to his application for patent.

(32) That the Gulick 1914 piston, Ex. 51, was in public use in this country by Gulick for more than two years prior to his application for patent.

(33) That the Monckmeier pistons, Exs. 3-V and 3-W, were in public use in this country for more than two years prior to Gulick's application for patent.

(34) That the piston disclosure in the Schoengarth patent 1,174,092 was in public use and on sale in this country for more than two years prior to Gulick's application for patent.

(35) That a piston of the construction disclosed in the Schoengarth patent 1,174,092, but without the adjusting devices, was in public use and on sale in this country for more than two years prior to Gulick's application for patent.

(36) That the sale and use of pistons and activities in the production and development of pistons by the following parties constitute adverse and intervening rights as against Gulick, plaintiff and intervening privities in title of the Gulick patent in suit, Elmer C. Long, Gustave C. Monckmeier, Walter L. Schoengarth, Albert L. Spillman and Kant-Skore Mfg. Co., Stephen D. Hartog, Frank Jardine and Aluminum Company of America, Howard E. Maynard and Maxwell Motor Co., Ray Day, William E. Vanner, W. K. Weems and Charles Chadwick.

(37) That defendants' pistons, Exs. 1, BBB, CCC, 3-J, 3-O and 8 do not infringe the Gulick patent in suit.

(38) That defendants' pistons, Exs. 1, BBB, CCC, and 8 do not infringe the Jardine patent in suit.

(39) That defendants' pistons, Exs. 1, BBB and CCC do not infringe the Maynard patent in suit.

(40) That defendants' pistons, Exs. 1, BBB, CCC, 3-O, 8 and 9 do not infringe the Mooers patent in suit.

(41) That defendants' piston, Ex. 1, does not infringe the Schmiedeknecht patent in suit.

(42) That prior art not cited in the answer may be used to show want of invention, particularly as to use of expedients.

(43) That prior art not cited in the answer may be used to restrict claims of patents in suit.

(44) That plaintiff is not entitled to the relief prayed for in the Bills of Complaint, or any part thereof.

(45) That said Bills of Complaint be dismissed.

(46) That defendants have and recover against the plaintiff the costs of suit.

MEMORANDUM.

PARTIES, JURISDICTION, TITLE AND JOINDER.

Chrysler Corporation as Party Plaintiff.

At the outset defendants raise two questions which concern parties, jurisdiction, title and joinder. In each suit the defense is made (1) that there is a defect of parties, since Chrysler Corporation is a joint owner of the Maynard patent, and (2) that the Aluminum Company of America is a necessary party defendant.

The Bill of Complaint alleges that plaintiff, The Cleveland Trust Company, is the owner of an undivided one-half interest in the Maynard patent, and that the

other one-half is owned by Chrysler Corporation which is beyond the jurisdiction of this court. Plaintiff contends that it has fulfilled the requirements of the law by pleading that Chrysler Corporation has been asked to join in the suit, has refused and is therefore joined as a party plaintiff without its consent. Defendant says that a previous refusal of Chrysler Corporation to join in a suit under the Maynard patent is not justification for a joinder in this case without first having obtained its consent.

Plaintiff relies upon *Independent Wireless Telegraph Co. v. Radio Corporation of America*, 269 U. S. 459 (1926), which defendant attempts to distinguish on the facts as here presented. The defense is raised in defendants' answers, paragraphs 12 and 23, and is applicable only as to the Maynard patent. The record shows that plaintiff has an option, Ex. B-5, whereby upon payment of $1.00 the other one-half can be secured. No cases have been cited in the Patent Law where a patent owner has attempted to enforce the patent by joining the other co-owner without his consent, although there are many cases in the general law as appears from defendants' citations.

In the *Independent Wireless case*, Radio Corporation had obtained an exclusive license under the DeForest patents, except for a personal, non-exclusive, non-transferable license in the DeForest Radio Telephone & Telegraph Company, and DeForest also held legal title to the patents. The DeForest Company was asked to join as a party plaintiff and refused, and was thereupon joined by the Radio Corporation without its consent as a party plaintiff. The Supreme Court held that under the circumstances an exclusive licensee was justified in joining the owner of the legal title to the patents without its consent. While Mr. Chief Justice Taft said at p. 468:

> "The presence of the owner of the patent as a party is indispensable not only to give jurisdiction under the patent laws but also, in most cases, to enable the alleged infringer to respond in one action to all claims of infringement for his act, and thus either to defeat all claims in the one action, or by satisfying one adverse decree to bar all subsequent actions."

and when it came to deciding the case then before the court it was held that the making of the DeForest Com-

pany a party plaintiff was sufficient, for he further said at p. 473:

> "The objection by the defendant that the name of the owner of the patent is used as a plaintiff in this suit without authority is met by the obligation the owner is under to allow the use of his name and title to protect all lawful exclusive licensees and sub-licensees against infringers, and by the application of the maxim that equity regards that as done which ought to be done."

Thus, the assignment of the one-half interest from Chrysler Corporation to the plaintiff set up a strong fiduciary relation between the parties as to the Maynard patent, as did the license in the *Wireless case* and the obligation was on the Chrysler Corporation as co-owner not to defeat the rights which it had agreed to assign or to detract from them in any way.

The Cleveland Trust Company is here proceeding to protect its licensees and sub-licensees under the one-half interest in the Maynard patent which has been assigned to it. In *Collins v. Hupp Motor Car Corporation*, 22 F. (2d) 27 (1927), the Court of Appeals of the 6th Circuit followed the Supreme Court's ruling in *Independent Wireless v. Radio Corporation, supra*, and Judge Knappen said, pp. 30 and 31, of the legal title of the plaintiff to the patent there in suit "It did not escape being an exclusive license merely because it was for an undivided beneficial interest in the patent, and although limited to the automobile manufacturers' trade," and went on to say that "Blackmore held the title to the patent in trust for Collins as well as for himself, and upon plain principles of equity was under obligation to allow his name to be used in proceedings to redress the joint grievance."

While the rule of Patent Law is that patent monopolies cannot be broken up into several monopolies and all be effective in the same territorial limits, *Gayler v. Wilder*, 10 Howard 477 (1850), this is not such a case as will warrant denying relief to the plaintiff on this ground.

ALUMINUM COMPANY OF AMERICA AS PARTY PLAINTIFF.

Prior to April, 1924, The Cleveland Trust Company had good title to the Mooers and Gulick patents and at that time gave a license to the Aluminum Company of America to make aluminum pistons under the Mooers

and Gulick patents. Plaintiff says that thereby was created a non-exclusive license, so that the Aluminum Company is neither a proper nor an indispensable party to this proceeding. Defendant says that the license to the Aluminum Company was exclusive, being on everything except pistons made entirely of cast iron or steel, and since this case involves aluminum pistons only, it is in effect an exclusive license as pertains to aluminum pistons.

Defendant likewise claims as to the Schmiedeknecht patent which was acquired at a later date, and defendant contends that the plaintiff's title as to the Jardine and Maynard patents is weaker even than that of the Gulick and Mooers patents. As to Jardine and Maynard, defendant claims the Aluminum Company is more than an exclusive licensee, and that under the decisions the plaintiff did not secure legal title to those patents.

Defendant asserts that in April, 1924, by the assignment, Ex. 38-B, paragraph 22, the Aluminum Company agreed to assign to the Trust Company all its patents or applications relating to pistons which it then owned or should acquire, thus including Jardine and one-half interest in Maynard, yet in the same instrument where it agreed to "assign," the Aluminum Company reserved to itself the exclusive license to make, use and sell aluminum pistons.

There is much argument in the briefs as to whether Aluminum Company of America is an "exclusive" licensee or a "sole" licensee. It is urged upon the authority of the *Six Wheel Corp. v. Sterling Motor Truck Corp.*, 50 F. (2d) 568 (1931), that The Cleveland Trust Company in this case does not even possess a license to grant licenses, the claim being that its title is less than the title found insufficient by the Court of Appeals of the 9th Circuit in the *Six Wheel case*. Further, the claim is made by defendants that the plaintiff is not entitled to the recoveries of profits or damages as sought in the Bill and that by failing to join the owner of beneficial interests in the patents plaintiff has lost whatever right it might have to the recovery of profits or damages.

The answer to these contentions is found in Equity Rule 37 which reads in part as follows:

> "Every action shall be prosecuted in the name of the real party in interest, but an executor, administrator, guardian, trustee of an express trust, a party with whom or in whose name a contract has

been made for the benefit of another, or a party expressly authorized by statute, may sue in his own name without joining with him the party for whose benefit the action is brought * * *."

If the testimony shows that The Cleveland Trust Company is trustee of an express trust and holds title to the patents in suit as part of the trust "property" or estate (pts. Ex. 26), under this Equity Rule the trustee would be entitled to maintain this action in its own name without joining with it the party for whose benefit the action is brought, if the facts warrant such a finding.

Examining the record, it appears that the trust estate consists of 4512½ shares, of which the Aluminum Company of America holds 1100 shares (Tr. Perfler, p. 271). Thus is disposed of in this suit at least, the interesting question as to whether or not The Cleveland Trust Company, in bringing these suits, should have joined the owner of the beneficial interests in the patents. However, The Cleveland Trust Company may be suing either as a trustee of an estate or in its own right. Under the Equity Rule "the trustee of an express trust * * * may sue in his own name without joining with him the party for whose benefit the action is brought."

In another case recently heard by the Master, *Cleveland Tractor Co. v. International Harvester*, Equity No. 3860, a similarly interesting question as to joinder of the licensor and the licensee was raised, and it was there deemed unnecessary to be determined, in view of the other findings in the case. This case presents a different situation because of the trust relationship of the parties, which seems to furnish a sufficient reason for denying defendant's claims that there has been a misjoinder because of failure to make the Aluminum Company of America a party plaintiff.

Venue as to Sterling Products Corporation.

Sterling Products Corporation was named as a defendant in each Bill, and on motion was dismissed therefrom, there being no evidence that Sterling Products Corporation entered its appearance or that Sterling Products Corporation controlled the proceedings to the exclusion of any or all of the defendants. Plaintiff sought to secure jurisdiction of Sterling, apparently to obtain a declaratory judgment affecting Sterling. The Master heard the evidence on the question of its appearance in these causes, and finds that there is no ap-

pearance, and having no power to recommend a declaratory judgment, the evidence on this subject should be expunged from the record as no appearance is made out.

The situation as to Sterling Products Corporation in this case is controlled by the decision in *The Cleveland Trust Co. v. Simmons Mfg. Co., et al.*, Equity No. 3510, where the same question was presented, and his Honor, Judge Jones, held that no decree could be entered against Sterling Products Corporation in the entry of March 11, 1932, which was affirmed by the Court of Appeals of the 6th Circuit in 66 F. (2d) 134, on June 29, 1933.

CLAIMS AND DEFENSES.

The first and principal defense is that the pistons made by defendants are in the Public Domain and free and open for the public to use. If this be true, defendants have not infringed any statutory rights of plaintiff. The questions of infringement and validity are interwoven in these suits, notwithstanding plaintiff's effort to keep them separate, and this is true for plaintiff relied upon 5 patents with 51 claims directed at the 7 accused devices of defendants.

Defendants contend that no claim of any of the patents in suit, however broad it may be, can be construed to cover any of the devices; in fact, if any such claim does or can be read upon any of the devices, such claim is invalid as beyond the statutory grant of the patent. Since defendants assert that their pistons are within the Public Domain and they cannot be excluded from making them wholly or partly or selling or using them, our first task is to examine the accused devices.

The evidence offered as to the prior art in this case is to be first considered in examining the disclosures of the several patents. As to the record, there is little dispute as to dates. The controversy is principally as to what the evidence discloses to "any person skilled in the art or science to which it appertains or to which it is most closely connected." The patent statute (R. S. 4888) uses that expression as applying to the required disclosure as a pre-requisite to a patent grant, and the same applies to the sufficiency of any prior patent or printed publication.

The expert witnesses called are Dr. Zay Jeffries, Engineer of The Aluminum Company of America, for plaintiff, and for defendants, Louis M. Stellman, former Engineer of The H. H. Franklin Automobile Company,

and George P. Dorris of Dorris Motor Company, all of whom are skilled in the art and whose views are entitled to weight.

Particularly is the history of piston development pertinent in considering these patents for plaintiff's claims of invention are for combinations of old elements alleged to perform a useful function for the first time, *Expanded Metal v. Bradford*, 214 U. S. 366 (1909); and for which plaintiffs claim that it is no answer to such a patent, to say that any or all of the elements are old. *Wisconsin v. Hirschy*, 28 F. (2d) 838, 841 (8 C. A. 1928).

How this situation as to combinations arises in this case is particularly shown by the plaintiff's claim that the Gulick invention illustrated in the patent employs webs in combination with other parts of the pistons and horizontal and vertical slots; and that flexibility results both in the sections of the thrust face adjacent to the vertical slots and in the webs.

The plain trunk piston as it existed prior to the pistons in suit is first to be considered. From the evidence it appears that the trunk piston is still used, for General Motors cars use nothing but cast iron trunk pistons and only in trucks use aluminum trunk pistons.

Pistons Charged to Infringe.

Defendants' pistons consist of two sets represented by 7 accused devices, viz: Set 1, being Exs. 1, BBB, CCC, 3-J and 3-O, known in this case as the Sterling pistons, and Set 2, being Exs. 8 and 9, known in this case as Ray Day pistons.

Set 1—Sterling Pistons are claimed by defendants to be trunk pistons with the application of such expedients as were long known in the art as applicable to such pistons; that the specific devices had been shown and described in patents and publications prior to the alleged inventions more than two years before the applications of any patent in suit; and which pistons had been abandoned to the public and as to which plaintiff is now estopped to lay any claim against the public generally, including these defendants; of these, defendants further assert that

Exhibit CCC is the ordinary trunk piston with the old wrist pin bosses, internal ribs from head to boss, and with reliefs in old circumferential slots, each extending a little over a quarter around the piston, the head is of reduced diameter, which reduction extends below the

lowest ring land as was usual and ancient, to permit oil entrance or exit from the cylinder wall of the interior of the piston; and the skirt is split on one side from bottom to top slot, forming a T-slot in one bearing face which was likewise old.

Exhibit BBB differs from CCC only in that the reliefs in the region of the wrist pin bosses are deeper and cut rather than molded therein, and the circumferential slots are cut in a lathe and not sawed, so that the slots are continued past the old internal ribs from the head to the wrist pin bosses.

Exhibit 1 differs from BBB in that the reliefs have been made still deeper, the sides have been dashed-in and made flat, leaving holes at the bottom of the skirt, like happens if a tin can is smashed in; the dashed-in formation produced a stiff piston, being a truss construction with a chord spanning an arc, and when this piston scored, resort was had to what is now known as the "Keystone relief."

Exhibit 3-J differs from CCC in that the circumferential slot is in the lowest ring groove.

Exhibit 3-O differs from 3-J in that relief is secured by the method of making the skirt oval or elliptical, with a long diameter or a major axis at the thrust faces, and with a short diameter or minor axis along the wrist pin bosses; the circumferential slot is in the lower ring groove only on one side and extending a little over one-fourth of the circumference; the vertical slot does not extend to the bottom of the skirt and stops one-third of the way up.

Set 3—Ray Day Pistons are substantially alike except that in Ex. 9 the vertical slot has not been completed but is intended to be by sawing by a mechanic before installation; skirt is supported from the head by lugs, one on each side extending from the head to the boss as shown in the old Chenard & Walcker patent; except that the piston skirt is not described as split; and flexing is not a necessary factor, for in these Ray Day pistons the skirt is strengthened by a series of annular ribs on the inside.

TRUNK PISTONS AND EXPEDIENTS.

The ordinary trunk piston in use for more than thirty years consists of the piston proper carrying the rings and the cross-head combined in one, so as to pro-

vide what is now called the head and skirt. It has wrist pin bosses projecting from the side walls of the skirt, which are perforated so that a wrist pin may be passed therethrough from which a connecting rod may operate between the bosses. The trunk piston is strengthened interiorly by webs located and formed in various designs. The head carrying the ring grooves was smaller at the ring lands than the skirt, for being the hottest parts, it would expand more than the skirt. The ring grooves receive piston rings now universally split to permit them to expand and contract in order to seal the cylinder, while the skirt itself has a sliding engagement within the cylinder wall.

To this structure of the trunk piston expedients were added before the patents in suit. Relief in the region of the wrist pin bosses was provided for the skirt and this varied in accordance with the conditions encountered or the wish of the designer. The depth of the relief varies from what is necessary in the cast iron piston as shown by the exhibits to the deep relief of the Lynite piston or the extreme relief of the Ferry piston or of the slipper piston of the Ricardo patent.

Relief has also been obtained by "oval grinding," i.e. by grinding the piston skirt oval throughout the entire length, which practice was shown by exhibits and noted by the experts.

Another expedient was to run a groove around the skirt just below the lowest ring land to prevent creeping of the oil upwardly past the piston rings, and this groove was perforated to permit the oil to flow through the piston back into the crank case.

An addition to this last expedient was practiced in the reduction of the diameter of the lower ring land to permit it to wipe the oil down into the groove, thus preventing its passing upwardly into the combustion chamber where it might form carbon. This expedient was shown in the Howe patent and described by Stellman as used by Franklin before any of the patents in suit.

Another expedient, instead of a groove with holes, was the lengthening of the holes to make a more or less continuous slot or slots so that they extended more or less all the way around the skirt. Several prior patents show this, the slot forming a dividing line between the diametrically reduced head and the skirt. In three of the Long patents he reduced the part beneath the lowest ring land to the circumferential slot, and Schoengarth did the same. The circumferential slot isolates the part

below the slot from the part above the slot, which separation Franquist is partial to—to about 1/0 degrees, and in others complete through 360 degrees, while in the Ricardo slipper piston the slippers are completely isolated from the head.

The useful function of the slot or insulating gap is to separate the head from the skirt, thus permitting the skirt to run cooler than formerly, and was described as early as 1902 in the Ebbs patent, being repeated in Spillman & Mooers, Chenard & Walcker, and recently in Ricardo. The progressive history of this separation of head from skirt starts with Ebbs 1902, making the connection to the skirt about midway of its length; Spillman & Mooers make the connection at the bottom; Chenard & Walcker through the wrist pin bosses; Franquist at the top by slotting the piston for one-half of the circumference; and Ricardo separating the slippers circumferentially from the head by connecting the webs just below the top of the slipper and at the bottom, somewhat above the lower termini of the slippers. The three Long patents make the connection in the first like Franquist and in the second and third like Ebbs and Ricardo. Thus the extent of the separation of head from skirt circumferential and the mode of its connection has varied back and forth from 1902 to 1919.

While the skirt slides in the cylinder, the problem is to conduct the heat from the head, which depends upon the connection or isolation of the head and skirt, and the skirt is subject to expansion. No problem was involved in the use of a cast iron piston since there was no difference in the co-efficients of expansion. With the introduction of aluminum pistons with the high co-efficient of aluminum as compared with cast iron, it was either necessary to allow such clearance as to result in extreme looseness and piston slap when the engine was cold, or split the piston as was done with the piston ring. The difficulty was met in the same way as in piston rings which, when subjected to heat, must still maintain their spring engagement and this was accomplished by wholly or partially cutting through the skirt wall.

Defendants contend that the entire problem was met in the Franquist patent, although the same result is claimed to be shown by the split skirts of Ebbs, Van Bever, Rainforth and Serex. Splitting of the skirt became so common that the Patent Office took the position that this was not invention in any particular piston, and refused a patent therefor (Law Examiner's Decision,

Exs. 4-C to 4-F). Another expedient in cast iron pistons particularly, was to lighten the skirt which was accomplished in several ways, as cutting holes in the skirt or even cutting out a part of the skirt in the region of the wrist pin bosses. The experts noted this practice shown in Spillman & Mooers, Ferry and slipper pistons of White and Ricardo, where the slipper is perforated and even the sides of the skirt cut away.

Defendants contend that these expedients were natural developments within the skill of the calling, and were actually in practice before the advent of the devices of the patents in suit, and the further claim of the defendants is that in the accused devices and even in the structure shown in the patents in suit there is merely an incorporation, more or less, of such expedients in a single trunk piston; and that each expedient performs the same function as it did before the natural production of a better piston. Defendants rely upon such rule followed by the courts, as to a stove in *Thatcher Heating Co. v. Burtis*, 121 U. S. 286 (1887); a heating stove in *Hailes v. Van Wormer*, 20 Wall. 353 (1873); storage case of *Office Specialty Mfg. Co. v. Fenton*, 174 U. S. 492 (1899); and the concrete mixing and conveying device in *Powers-Kennedy v. Concrete Co.*, 282 U. S. 175 (1930).

THE EXPIRED FRANQUIST PATENT.

The Franquist patent is relied upon by defendants, who claim Franquist gathered everything of the prior art which his claims describe in combination. The specification of this patent is brief, less than two pages, and seems to be the clearest description of conditions encountered, fundamental means to meet those conditions, operation and result, of the many patents and printed publications before the court. Its brevity and conciseness stand out in contrast with the voluminous specifications of the patents in suit and the professional dissertations of experts.

Defendants claim that the Franquist specification aptly describes the conditions, fundamental means to meet those conditions, operation and result of the Sterling pistons, and that all the patents (except Schmiedeknecht) illustrate the specific Franquist embodiment, so that there is no infringement. The clarity of the Franquist patent No. 1,153,902 is seen in the clauses as to objects and purposes, p. 1, lines 9-25:

"This invention relates to internal combustion engines and has for its primary object the provision of a piston which will eliminate the piston clatter at all speeds and temperatures of the motor.

"With this object in view, the invention consists of a piston having a sleeve which is circumferentially compressible and is adapted to have a snug sliding fit in the cylinder when cold, so that upon an expansion of the piston its sleeve will automatically yield sufficiently to prevent the piston from sticking in the cylinder, and after the cylinder has also expanded will again automatically resume substantially its normal size and take up the free play between the cylinder and piston, which would otherwise occur."

Defendants claim that this language clearly defines the objects and purposes of Sterling pistons and Ray Day pistons, and that in the view of plaintiff's expert it is also true of the Gulick, Jardine and Maynard patents. In the Franquist patent the word "sleeve" is used instead of skirt, to apply to the same part. While brief, the defendant contends the claims of the Franquist patent are fundamental, that they read upon and comprehend all of the accused devices, and that this plaintiff has so heretofore contended as to Ex. 1 in the *Simmons case*.

Plaintiff relied upon the Franquist patent in the *Simmons case*, having acquired title thereto on May 16, 1924, when the patent still had some eight years to run. Plaintiff thereafter included the Franquist patent in licenses, Ex. 39-C, List A, and royalties were collected from the various licensees under this Franquist patent.

The piston in question in the *Simmons case* was a duplicate of Ex. 1 in this case, and it was there claimed to infringe Franquist and other patents in the *Simmons case*. The Gulick patent issued July 21, 1931, and the interlocutory decree in the *Simmons case* was entered September 25, 1931, decreeing the validity of the Franquist patent and infringement by duplicate of Ex. 1 in this case, and thereafter followed the injunction on November 5, 1931.

The testimony of plaintiff's expert as to the Franquist piston and its value developed an interesting situation. Dr. Jeffries said, Tr. 207, that he tested the Franquist model piston and discovered it worked no differently than Ex. 1 without a slot, and was a trunk piston.

This discovery by test the Doctor made the day before the decree in the *Simmons case* was entered, but he did not report this fact to counsel who at the same time were attempting to extend the order of injunction (including Franquist) to Sterling. This effort to include Sterling in that case was denied by the District Court and affirmed in the Court of Appeals. Thus, within two months after the new patent issues to Gulick, notwithstanding a suit is filed charging infringement of Franquist, an order of injunction entered, the expert (and plaintiff must be charged with such knowledge) suddenly discovers that the Franquist patent was nothing at all, although it had been a basis of the decree in the *Simmons case*.

Defendants urge that comparison of the Franquist and the Sterling pistons shows identity of structure, function and mode of operation. The claim is that Ex. CCC is only different from Franquist in that there is one slot; that the circumferential slot of Franquist is in the lowest ring groove, while in Ex. CCC it is just below the lowest ring land, but there is no distinction in this because in Ex. 3-J and Ex. 3-O the slots are located as in Franquist.

Ex. 3-J has the circumferential slotting in the lowest ring groove and in addition has a Keystone relief in the thrust faces forming the so-called Keystone relief not involved in this case, of which more will be said at another place. Ex. 3-O has a circumferential slot in the ring groove; the vertical slot is not completed but terminates one-third of the way from the top of the piston, like Franquist in this respect and having equivalent reliefs extending the full length of the skirt in the region of the wrist pin bosses.

The contention of defendants is that the Sterling pistons approach so closely to Franquist in fundamentals that even in details there is no difference. Whatever difference there is resides in expedients old in the art; the only new thing added being the Keystone relief which is not involved here, and the sole distinction being that instead of one vertical slot, there are four slots or gutters in Franquist.

As to mode of operation, defendants say the Sterling piston is the same as the Franquist, each having a head separated from the skirt in the region of the thrust faces by circumferential slots defining the line of division between a diametrically reduced head, relief in the region

of the wrist pin bosses which, upon heating the reliefs compensate for expansion, and with slots closing to compensate for the expansion. Notwithstanding the grant of the Franquist patent, whether expired or unexpired, having all presumptions of validity in its favor, plaintiff's expert asserts that Franquist is an ordinary trunk piston lacking flexibility to function different from a trunk piston, and this in spite of the fact that the specification says that the structure is flexible.

Plaintiff points out that Franquist employs four gutters where the patents in suit and the accused devices employ only one slot. Question then arises whether the gutters permit the expansion and contraction of the skirt as does the slotting of the skirt. While Franquist causes contraction of his piston by what he calls circumferential compression, plaintiff claims that this is not sufficient for successful operation of the Franquist piston, although the testimony lacks the evidence of any motor tests establishing this contention. The application of a can opener device (defendants' Ex. 3-I) showed that by pressure of the hand the gutters would be closed sufficiently to hold a coin, which would drop out when the hand pressure was released.

Notwithstanding the pendency of the Simmons suit, the expert testified (Tr. 205) that "the Franquist piston principle so far as I know is not used at all in pistons at the present time," and (Tr. 204) that "the construction of the Maynard piston is different from that of Franquist; its mode of operation is different and its result is different," and this testimony is given at the same time that plaintiff and witness Jeffries claimed that Ex. 1 and also Exs. RRR and CCC employed the Maynard principle. Such contention is at variance with the position taken by plaintiff and those through whom plaintiff claims. By reason thereof, defendants contend that plaintiff is not only estopped by taking these positions against these defendants, but is wholly estopped from questioning the utility of the Franquist piston or that it embodies the structure, function and mode of operation of Ex. 1, as well as of the other accused devices.

ESTOPPEL OF PLAINTIFF TO DENY UTILITY OF FRANQUIST.

Defendants urge that since plaintiff has used the Franquist patent as a basis for this trustee to keep licensees in the fold, and is disowned as it expires, that

thereby arises an equitable estoppel. Having abandoned the expired patent, the plaintiff now seeks to perpetuate its monopoly, relying upon another, the newly issued Gulick patent. Defendants urge that if there is no estoppel, then a third patent might issue after the fourteen years had elapsed, replace Gulick, and the monopoly thus be perpetuated indefinitely. As an answer to such practice defendants urge an equitable estoppel in favor of defendants, a presumption of operativeness and utility of a patent structure conclusive against plaintiff, and that the question is one of utility.

A case in point of like "quite unusual circumstances" is *Dalton Adding Mach. Co. v. Rockford Milling Mach. Co.*, 253 Fed. 189 (DC Ill., 1918), where plaintiff owned the Helmick patent set up in defense, and marketed machines under that patent, and the court said:

> "The plaintiffs thereby held out the patent to the public as a valid patent, and gave warning to the public and to any possible competitors that they asserted and claimed a monopoly under that patent."

In that case plaintiff brought suit against another for infringement of the Helmick patent, and on issue of the Hopkins patent involved in the then pending case, the suit on the Helmick patent was voluntarily dismissed. Judge Sanborn further said that the facts did not, strictly speaking, there create an equitable estoppel in favor of defendants, since they were not in the same business and were not misled by plaintiff's acts, yet the facts did strengthen the presumption of inoperativeness, placing the plaintiff in inconsistent positions.

In the case at bar, not only are the parties in the same business, but plaintiff was prosecuting the Simmons suit, including its claims on Franquist, at the time of the trial in this case. An authority relied upon in the *Dalton case, supra, Rice-Stix Dry Goods Co. v. Scriven Co.*, 165 Fed. 639 (C. C. A. 8, 1908), was where plaintiff had sold a structure covered by a Brown patent under trademark and contended the trademark had not expired because the patent was invalid. Judge Hunger says, p. 645:

> "* * * Having derived, through the assertion of the validity of the Brown patent, all the advantages incident to the possession of a valid patent, it will not now be heard to assert the contrary, as a means of escaping consequences arising upon the termination of the monopoly secured through the patent. This is based upon the well-recognized rule that:

'Equity will refuse to aid a complainant in cases of this character, who is himself guilty of making material false statements in connection with the property he seeks to protect.' *Hilson v. Foster*, 80 Fed. 896."

And further, p. 646:

"It matters not that complainant may have supposed the Brown patent to have been a valid one."

PRESUMPTION OF OPERATIVENESS.

With the grant of a patent as provided in Revised Statutes 4886, there arises a presumption not only that the patent is valid, but that its structure is practically operative. Otherwise, the grant of a patent by the government would be a vain thing, and there is the further presumption that the expert examiners in the Patent Office have examined the structure for operativeness. Such rule applies to a patent in suit and also to any prior patent advanced as a reference in an infringement suit. Such was the view of Mr. Justice Roberts in *Powers-Kennedy Co. v. Concrete Co.*, 282 U. S. 175 (1930), when he said, p. 184:

"Methods and apparatus for moving concrete by compressed air had been previously invented. See Smith's patent, 122,498. The court below, in No. 3, indicated that this had not been found practicable. There is no support in the record for any such finding and against it stands the presumption of operability from its patenting."

To the same effect is *Dashiell v. Grosvenor*, 162 U. S. 425 (1896) and *Dalton v. Rockford*, *supra*.

In view of this presumption, the burden of overcoming it rests upon plaintiff.

UTILITY—OPERATIVENESS.

The rule is that a patent structure is not to be considered by its standing alone, but in the light of the art as it existed at the time of the advent of the patent in suit. If the law were otherwise, then one could only copy in detail what is shown and described in the prior patent without using "the skill of the calling" at the time of the advent of the patent in suit. Thus, to determine the operativeness of a patent structure, a skilled mechanic can take the disclosure and supplement it by what

he knows. *Walker on Patents*, 6th Ed., p. 147, states the rule:

> "If, however, an invention performs a good function, though but imperfectly, its utility is not negatived by the fact that it is susceptible of improvement, which will make it operate much better, nor by the fact that some prior invention performed the same function quite as well, or even performed it with superior excellence. Nor is utility negatived by later inventions which are so much superior to the patented process or thing, that they entirely superseded the use of the latter. Indeed, patents are never held to be void for want of utility, merely because the things covered by them perform their functions but poorly."

A leading case on this is the *Bell Telephone case*, 126 U. S. 1 (1888), where the patent was attacked because it was alleged to be inoperative, and Mr. Chief Justice Waite comments on this, p. 536.

The operativeness of an anticipating device, which was disclosed in an engineering publication, and concededly not being commercially practicable, yet it did not lack invention, was held in *Sparks-Withington Co. v. Joy*, 270 Fed. 449 (C. C. A. 6, 1921), where Judge Knappen affirmed Judge Westenhaver of this District, and said at p. 452:

> "We think the Tice device, as disclosed by him, cannot be pronounced inoperative in a patentable sense, although under many conditions likely to be met it would fail to function, and thus could not be successful commercially. But, testing the disclosure as we think we should by the rules applicable to a patent, the device, as described, did not lack invention merely because the inventor did not successfully bring his art to the highest degree of perfection, nor because, without changes in or additions thereto, it could not be successful commercially."

To the same effect in *Universal Rim Co. v. Firestone Steel Products Co.*, 289 Fed. 884 (1923), opinion also by Judge Westenhaver, and *Sun Ray Gas Corporation v. Bellows-Claude Neon Co.*, 49 Fed. (2) 886 (C. C. A. 6, 1931), where the contention was made that the Neon tube of the patent did not have a life of 1,000 hours as was required in order to make the structure commer-

cially feasible, and of this, Judge Hickenlooper said, p. 889:

> "Conceding that present day competitive conditions require a life of 1,000 hours, that Claude contemplated the use of say 2 mm. pressure, that at this pressure the life of the tube would be much less than 1,000 hours, and that the present great commercial utility of neon tubes is due almost exclusively to the later discovery by some one of the advantages of using pressures as high as 15 mm., or even 20 mm., the argument still falls far short of establishing invalidity. The invention of Claude was the primary one on which all subsequent developments were founded. The test is not that of commercial utility, but rather of operative utility and the forward step."

Plaintiff's answer to this contention is that the Franquist patent was never used commercially, and that the effort to use it commercially failed because it was no better than the trunk type piston so far as commercial flexing was concerned. This is met by the decision of Judge Knappen in *Sparks-Withington Co. v. Jay, supra*, for the argument was there made that by actual test the device was shown to be inoperative and useless. Judge Knappen goes on to point out in the quotation, *supra*, that a device cannot be pronounced inoperative in a patentable sense, although under many conditions it would fail to function, or could not be used successfully commercially.

Plaintiff also relies on a rule that "broad and less broad claims in patents owned by the same party are infringed by the same structure," citing *Byers Mach. Co. v. Keystone Driller*, 44 F. (2d) 283 (C. C. A. 6, 1930). From the first Syllabus and reading of this case it appears to have concerned a basic patent, and "if valid, it is entitled to a breadth of construction permitted to pioneers in any art." Admittedly, the patents relied upon by plaintiff are not pioneer patents, which clearly distinguishes the situations.

The burden of overcoming the presumption rests upon plaintiff, and plaintiff offers no convincing test of the inoperativeness of Franquist.

Plaintiff is estopped to deny that Franquist advanced the art and to deny that Franquist discloses an operative piston which will automatically yield sufficiently to prevent the piston from sticking in the cylinder

while hot and slapping when cold, and is further estopped to deny that Ex. 1 has the essential structure, function and mode of operation described in the Franquist patent, which likewise applies to Sterling pistons, Exs. BBB, CCC, 3-J and 3-O. Holding otherwise would permit the plaintiff to shift its position as its interest required, which is not permitted in a court of equity; to which may be added that plaintiff has not overcome the presumption of operativeness, utility and practicability of the Franquist patent raised by the grant of the patent.

In this connection defendants also urge that there is a misunderstanding as to the function of vertical slotting, that is to say, that the vertical slot in Ex. 1 does not make the skirt of the piston flexible at the top. The same claim is made for the other Sterling pistons. Defendants assert that a structure such as Ex 1 has a skirt which is not flexible at the top, with its dashed-in walls attached to the head by additional ribs, both inside and out. Defendants claim the compensation results from the use of the Keystone relief which is demonstrated in the action of the forces by the vectors, as shown in Defendants' Ex. 4-A.

The claim is that in the Sterling pistons the skirt is tied to the head at the top, and expansion must be and is compensated for by the reliefs in the region of the wrist pin bosses which have to be carried into the thrust faces at the top. Defendants' claim is that such Keystone relief only made the Maynard piston workable, of which more later. Finally, defendants urge that the Sterling pistons act at the top like the plain trunk pistons with slots, as in the prior art, providing flexibility at the bottom with compensation at the top by the Keystone reliefs. In this it is urged that the Sterling pistons cannot be distinguished from the Franquist which they follow so closely in structure, function and mode of operation. If this be true, then defendants have not invaded the domain of plaintiff's patents, and equitable relief under the statute should be denied.

ABANDONMENT BY GULICK OF FEATURES IN STERLING PISTONS CLAIMED TO INFRINGE.

The defenses of abandonment and public use were raised by the answers, and came into the case with plaintiff's position that the 1911 and 1914 pistons were within the Gulick patent (Tr. p. 235).

Early in the testimony of inventor Gulick it appeared that he made pistons in 1911 and 1914, represented

by Exs. 48 and 51. Upon defendants' insistence that plaintiff should state what Gulick patent claims covered these early pistons, before the case was closed, plaintiff's counsel enumerated certain claims which the two early Gulick pistons showed as exemplifying claims of the Gulick patent, which claims were also infringed by the various Sterling pistons.

This presents a question whether the subject-matter involved in the 1911 and 1914 pistons was abandoned to the public by the plaintiff or its privies in title prior to the earliest applications of the patents in suit. If abandoned, those pistons are in the public domain and defendants have not infringed the statutory rights of plaintiff by manufacture, wholly or in part, and by sale of any pistons corresponding to those abandoned or deviating therefrom in matters involving merely mechanical skill, which in this case are the obvious expedients of the piston art.

The statutory requirements on the subject of patent pertinent here are R. S. 4886, 4920:

> "Any person who has invented * * * any new and useful * * * machine, * * * unless the same is proved to have been abandoned, may * * * obtain a patent therefor * * *.
>
> In any action for infringement the defendant * * * may prove on trial * * * (5) that it had been in public use or on sale in this country for more than two years before his application for a patent, or had been abandoned to the public."

These requirements both as to prior use and abandonment must be considered in the light of the facts in the case at bar. There are two different issues, one, a statutory bar, and the other, at large on facts to be established; but plainly the latter may be made out on proof directed to what occurred either before or after the bar had fallen.

Plaintiff states that the Sterling pistons infringe from 5 to 9 claims of the Gulick patent embodied in these 1911 and 1914 pistons, so that with the facts which developed at the trial, the issue is made as to whether Gulick abandoned his invention. Gulick testifies that in 1908 he conceived a piston like Ex. 51, the 1914 piston, but he did nothing except make sketches until May, 1911. The 1911 piston (Ex. 48), the head of which Gulick states was diametrically reduced to the slot, was tested out in May, 1911, by the use of a set of such pistons in a motor-

cycle; they were also given a block test of 4,000 revolutions per minute, and while one broke at the pin boss, there was no seizure; that test established the flexibility of the piston.

In July a set of such pistons were placed in an Excelsior motor and run for 24 hours; the engine containing these pistons was then placed in a Renault car and driven to the Elgin road races in August, and found satisfactory. In his Preliminary Statement in Interference No. 49,569 (Defendants' Exs. 5F-1 and 5F-2), as to whether the test was a reduction to practice and whether Gulick was satisfied, he says;

> "that on or about the 25th day of August, 1911," (date of Elgin road races) "he first explained the invention to others; that he first embodies his invention in a full sized engine, which was completed about the 25th day of August, 1911; and that on the said 25th day of August, 1911, the said engine was first successfully operated, at the City of Chicago, County of Cook, in the State of Illinois."

The run to Elgin was 150 miles round trip, and the Renault car was driven until November 1, 1911, over 3,000 miles for personal and company business, operating to his satisfaction, and except for mechanical repairs the pistons were in perfect condition on November 1st, when they were removed from the car, the car sold with other pistons in it, and pistons like Ex. 48 were scrapped.

No original drawing of these pistons has been preserved, the only drawing being that of the Gulick original sketch (Ex. 36), and his detail drawing, both showing the detail construction of the application. In the meantime he had taken his piston drawings to various patent attorneys, and took out applications for other patents. Apparently he was so well satisfied with the 1911 test that when he made the Ex. 51, the 1914 piston, it was at once placed in his own Amplex car which was driven anywhere from 2,500 to 5,300 miles from July 16th to November 11th, the car being used for general purposes by him and for the company with which he was then connected. He testified that the pistons gave perfect satisfaction, and on November 11, 1914, were removed from the car at the Amplex plant and later sold with other junk when the plant was sold in receivership.

No sketch of the 1914 piston has been preserved except we have the piston construction of the application which Gulick says was his idea of the proper design.

Gulick did nothing with his piston until in August, 1917, when it was turned over to the Packard Motor Car Company with other so-called inventions for which he had given an option to Packard in March, 1916. Packard did nothing with this piston until an application was filed November 30, 1917, although Packard had taken out many other applications since acquiring the option in March of the previous year.

Defendants contend that the 1911 and 1914 pistons were thoroughly abandoned. There is no evidence to corroborate Gulick of any communication to the Packard counsel, Tibbetts, about these 1911 and 1914 pistons. The 1911 and 1914 pistons do not appear in his application, which illustrates and describes only the web piston of the Gulick 1911 sketch and the 1914 drawing, and there is no other evidence that they ever were tried out or had any commercial history. The 1911 and 1914 pistons do not even appear in his affidavit of December 2, 1921 (Ex. 4-L, p. 1859-1860), but again what appears is the drawing of the application construction (Ex. 32), and the affidavit states, referring to the blueprint like Ex. 32:

> "that a photoprint of such blue print is attached hereto; that the longhand notes on said blue print which show in the photoprint were made by him on the blue print prior to the month of October 1915; that said invention was incorporated in an automobile engine and successfully operated in the United States prior to the month of October 1915."

There is no evidence that such a piston was ever made, let alone tested; and the date of October, 1915, carries back of the filing date of the Schoengarth patent. Any help in the way of correspondence between parties that could be obtained as to the relations between Gulick, the inventor, and the Packard Company, his assignee, the Packard Company a beneficiary of this plaintiff trust, was denied as counsel stood upon their rights as to privileged communications.

The 1914 piston first comes to light on November 8, 1922, when Gulick made the sketch (Ex. 33) bearing that date at Cleveland, in preparation of the Interference. He says he did not tell anyone about the 1911 piston "because he was not asked."

In this situation the following statement in the recent *Teapot Dome* case, 275 U. S. 13 (1927), by Mr. Justice Butler, is quite in point, and this authority was

again cited by Mr. Justice Cardozo in *Cooper v. Dasher*, 54 Sup. Ct. Repr. of November 15, 1933, at p. 7:

> "Familiar rules govern the consideration of the evidence. As said by Lord Mansfield in *Blatch v. Archer*, Cowper 63, 65: 'It is certainly a maxim that all evidence is to be weighed according to the proof which it was in the power of one side to have produced, and in the power of the other to have contradicted.'"

Considering Gulick's testimony as to differences between the 1911 piston and the 1914 piston, his personal views appeared as to what design will satisfy the engineer, overlooking the fact that in 1914 he merely redesigned the 1911 piston for aluminum use, put in two webs instead of one, ran the horizontal slot all the way around, and made the vertical slot nearly straight.

Gulick's activities and the chronological history of the discovery of his device and of his piston patent extending over twenty-three years are unique:

1908: Conception like Ex. 51, the 1914 piston (Tr. p. 742).

1911: May, Motorcycle piston given block test and Gulick was thoroughly satisfied with it (Tr. p. 733); July, Excelsior automobile piston given a block test, to the full satisfaction of Gulick (Tr. pp. 745-6), and Excelsior motor with pistons like Ex. 48 given a run-in test (Tr. p. 707); August, Engine with the run-in pistons placed in Renault car and given a road test to Elgin, for 150 miles; ran perfectly to Gulick's satisfaction; which was the reduction to practice alleged in his Preliminary Statement (Tr. p. 815); November, after use of these pistons in the Renault car for the difference between 2500 to 4000 miles and 150 miles, using the car for personal use and for company business (Tr. p. 732), the pistons were allowed to go to the scrap heap.

1914: May, aluminum piston drawings made and ordered; July, aluminum piston made, not given a block test; had in his personal car and run for over 5,000 miles; thereafter, pistons were let go to the scrap heap (Tr. pp. 734, 739-42).

1916: March, Gulick gives option on piston to Packard with other devices.

1917: August, assignment to Packard Motor executed, and November 30th patent application filed.

1922: September 12th, amending application filed broadening claims and introducing flexibility; and on November 8th made sketch Ex. 33 of 1914 piston.

1922-1931: Interference proceedings with Long, Hartog and others.

1931: April, further amendments and patent issued July 21st.

The testimony of Gulick first given at this trial showed that the pistons of 1911 and 1914, as to fitting and results, ran perfectly (Tr. p. 708), and apparently a clear case of actual and statutory abandonment was made out not only for 1911 use but repeated in 1914. After recess, upon the following day witness Gulick showed a surprising knowledge of experimental use, and his testimony became an about face and an argument that the 1914 pistons were nothing but an experimental use as contemplated by the law; and he sought to limit his previous testimony by saying that the pistons "only operated satisfactorily as far as the split skirt idea was concerned." (Tr. pp. 755-6).

The question presented is one of abandonment, i.e. at large or statutory, both of which are covered by the statute R. S. 4886. *Walker on Patents*, 6th Ed., Vol. 1, in Chapter VII, under the general subject, discusses statutory abandonment as constructive abandonment. The policy of the law was early laid down by Mr. Justice Storey in *Pennock & Sellers v. Dialogue*, 2 Peters, 27 U. S. 1 (1829), where the court considers the then patent statute from the standpoint of abandonment, and says, p. 16:

> "It has not been, and indeed cannot be denied, that an inventor may abandon his invention, and surrender or dedicate it to the public. This inchoate right, thus once gone, cannot afterwards be resumed at his pleasure; for, where gifts are once made to the public in this way, they become absolute. Thus, if a man dedicates a way, or other easement to the public, it is supposed to carry with it a permanent right of user."

Courts approve a reasonable delay in the filing of an application when the completion of the invention and the testing of its values "by a series of sufficient and practical experiments is necessary," *Kendall v. Winsor*, 21 How. 322 (1859), and that abandonment may show "either by express declaration or by conduct equally significant with language." The rule is stated in *Pitts v. Hall*, 2 Blatchf. 235, by Mr. Justice Nelson, that the patentee may forfeit his right "if he use it publicly him-

self in the ordinary way of a public use of a machine at any time prior to two years before he makes his application for a patent."

The leading case is *Consolidated Fruit Jar Co. v. Wright*, 94 U. S. 92 (1876), which cites this rule, where was involved the defense of abandonment as well as prior public use and sale. After having made about two dozen fruit jars, Mason left one of them with the manufacturer and never called for it, so that it was sold at auction and this neglect for some eight years "is full of significance and has an important bearing upon the question of abandonment;" and Mr. Justice Swayne said, p. 96:

> "It is enough to say, without recapitulating the facts, that in our judgment the defence of abandonment to the public is also clearly made out * * *. Inventors are a meritorious class. They are public benefactors. They add to the wealth and comfort of the community, and promote the progress of civilization. A patent for an invention is as much property as a patent for land. The right rests on the same foundation, and is surrounded and protected by the same sanctions. There is a like larger domain held in ownership by the public. Neither an individual nor the public can trench upon or appropriate what belongs to the other. The inventor must comply with the conditions prescribed by the law. If he fails to do this he acquires no title, and his invention or discovery, no matter what it may be, is lost to him, and is henceforward no more his than if he had never been in any wise connected with it. It is made, thereupon, as it were by secretion, irrevocably a part of the domain which belongs to the community at large. The invention here in question is within this category."

The case most relied upon by plaintiff to negative abandonment is *Elizabeth v. Pavement Co.*, 97 U. S. 126 (1877), where the court says, p. 134:

> "An abandonment of an invention to the public may be evinced by the conduct of the inventor at any time, even within the two years named in the law. The effect of the law is, that no such consequence will necessarily follow from the invention being in public use or on sale, with the inventor's consent and allowance, at any time within two years before

his application; but that, if the invention is in public use or on sale prior to that time, it will be conclusive evidence of abandonment, and the patent will be void."

An inventor was testing the durability of his pavement over a period of years, and it was held that this was not a public use so long as the inventor was engaged in good faith in testing its operation. There the pavement was laid on a toll road, much used by traffic, and the inventor delayed filing, examining it daily, and while he did not find changes were necessary, the court said "yet he may justly be said to be using his machine only by way of experiment."

Light on this question of abandonment is to be had in the two cases of *Macbeth-Evans Glass Co. v. General Electric Co.*, 231 Fed. 183 (this District, 1916), which was a case involving the secret use of a process before applying for a patent thereon. The decision below was by the late Justice Clarke, and was affirmed in 246 Fed. 695 (C. C. A. 6, 1917), Judge Warrington writing the opinion. The court points out that the question of abandonment is one of fact and one of relinquishment of a right to a patent, and considers the situation analogous to what is involved here, where instead of continuing the practice of the invention in secret, the subject-matter thereof "is cast away or destroyed." The court considered the failure of the patent statutes to prescribe a period within which a patent must be applied for. In that case the inventor of a process for making glass used it in secret for nearly 10 years, selling the product. At the end of that time, when the secret was betrayed by an employee, the inventor applied for a patent and the court held that the policy of the patent law to secure the full benefit of inventions would be defeated if an inventor could withhold his invention from the public for an indefinite time, for his own profit, keep it a trade secret, and then have the right to secure protection under the patent laws. The reasoning of the Court of Appeals of the 6th Circuit was approved by Mr. Chief Justice Taft in *Woodbridge v. United States*, 263 U. S. 50 (1923), to the effect that the purpose and the result of the conduct of the inventor was unduly to postpone the time when the public could enjoy the free use of the invention. In this last case the Chief Justice spoke of the unconscionable postponement of the end of the inventor's

monopoly (there 10 years) as the result of the inventor's "deliberate design."

Almost the identical situation as is here arose in *Allinson Mfg. Co. v. Ideal Filter Co.*, 21 F. (2d) 22 (C. C. A. 8, 1927). Allinson reduced his gasoline filter (for dry cleaning) to practice in July, 1914, and continued its use until December, 1916, then he dismantled the apparatus, sold it, and went into another business. Later he went back into the cleaning business but did not use his filter, and after seeing another filter about three years later, somewhat in general aspects the same although not an infringement of the subsequently issued Allinson patent, he filed his application for the patent in suit. His use was entirely in secret and in his own business, the filter being made out of an old still, so that it was not a commercial device, and the court held this to be an abandonment, relying upon the *Macbeth-Evans case, supra*, saying that upon the facts it clearly constituted a public use within the purpose and meaning of the statute. Judge Lewis said, p. 26:

> "Assuming, however, that he had an intention at any time to apply for patent, which was not proven, the conclusion cannot be avoided that he wilfully and negligently postponed his application, and that, too, until after others had become engaged, to his knowledge, in efforts to discover and put in use a machine for clarifying gasoline for clothes cleaning purposes." * * *
>
> "In the light of the record we think he abandoned his rights when he dismantled his machine in 1916, went into the moving picture business and manifested no further interest in his invention until he saw Le Vora's machine in February, 1920."
>
> * * * * "We think it immaterial whether Allinson's inaction and lack of interest be defined as abandonment, willful negligence or cause for forfeiture. It was conduct in direct opposition to the purpose and policy of the law under which he might have acquired rights had he been diligent."

As in the *Macbeth-Evans case, supra*, the equitable rule of election applies. Gulick tested the 1911 piston, used it in his car for 3,000 miles, then scrapped it. He permitted the same thing to be done with his 1914 piston, retaining not even a sketch or sample of that piston.

When selling to Packard he did not tell Tibbetts about it and said nothing about the 1911 and 1914 pistons in his application, and did not even raise the question in his supplemental oath of December 2, 1921, but first tells of it on November 2, 1922, thus establishing a situation where the rule of election applies to make a case of abandonment. Packard was bound by Gulick's acts by its own failure, after acquiring the Gulick rights, to make any application before November 30, 1917, and of course plaintiffs are bound by the acts of Gulick and Packard, *Comptograph Co. v. Adder Machine Co.*, 41 App. D. C. 427.

STATUTORY ABANDONMENT.

The fact that a device is not used continuously for two years does not take it out of the statute, the Supreme Court having construed the patent statute as if the word "for" had been omitted, *Consolidated Fruit Jar Co. v. Wright, supra*. A patent is void because of a public use more than two years before the application, even though the device had been used only on a few occasions or for a short period of time, *Thomson v. Lorain Steel Co.*, 117 Fed. 249 (1902); *LeRoy v. Nicholas Power Co.*, 244 Fed. 955 (D. C. N. Y., 1917). There was no concealment of the pistons, for as to the use in the Renault car, Gulick testified that the 1911 Renault car was "used the same as any other car;" and the 1914 Amplex with his aluminum pistons was used for both company and personal business (Tr. pp. 732-737), and people in the shop saw them, so that no such circumstances there are a public use, *Smith & Griggs Mfg. Co. v. Sprague*, 123 U. S. 249 (1887), where Mr. Justice Mathews says, at p. 254:

> "It was a public use in the sense of the statute and within the decisions of this court, inasmuch as it was used by the complainant in the regular conduct of his business by workmen employed by him in its operation, and in the view of such part of the public as chose to resort to his establishment."

That the pistons when in actual operation were inside the cylinders and concealed from view, does not take such use out of the statute, *Hall v. MacNeale*, 107 U. S. 90 (1882). After the recess Gulick was not so sure that his pistons of 1911 and 1914 were perfectly satisfactory, and on the question that his activities were only what is known to the patent law as an experimental use, the

decision in *Eastman v. Mayor*, 134 Fed. 844 (C. C. A. 2, 1904), contains a complete discussion of this subject by Judge Coxe on p. 857-9, with the court's summary of the law:

"From these authorities we deduce the following propositions, as applicable to the present controversy:

"First. An inventor has a reasonable time in which to experiment for the purpose of perfecting the invention and demonstrating its utility.

"Second. The time thus spent, if in good faith, is no part of the two-year statute of limitations.

"Third. The experiments must be made in perfecting the invention as described and shown.

"Fourth. Experiments made in testing parts of the machine not covered by the invention will not have the effect of extending the two-year period.

"Fifth. As soon as the invention is completed, viz.: 'in such a condition that the inventor can apply for a patent for it,' the two-year period begins to run and the application must be made within this period.

"Sixth. The fact that the invention has been improved since its original embodiment does not demonstrate that it was then embryonic or incomplete.

"Seventh. When a clear case of prior public use is established the burden is on the inventor to prove by convincing proof that the use was experimental.

This rule has been followed in this Circuit in *Jenner v. Bowen*, 139 Fed. 556 (1905), where Judge, later Mr. Justice Lurton, referred to Judge Coxe's decision as fully considered and the cases all examined. This later case was followed by Judge Denison in *Austin Machinery Co. v. Buckeye Traction Ditcher Co.*, 13 F. (2d) 697 (C. C. A. 6, 1926), and by Judge Westenhaver in *Kerner Incinerator Co. v. Townsend Estates, Inc.*, 27 F. (2d) 599 (N. D. Ohio, 1926). The use does not escape the statute unless the experimental use is limited to such use as is necessary to determine the ability of the device to perform the function for which it is designed. The inventor is entitled to use or test the device during its development, to an extent to determine its utility or ability to fulfill the function for which it is intended. When the purposes of the test are fulfilled and success indicated, then

the period of experimental use ends, and the statutory 2-year period begins.

The splitting of the piston having proved successful in 1911 could not be made the subject of additional experimental use in 1914, and thereafter be patented as in the Gulick patent without reference to the modification (aluminum) which was made in 1914. The defendants having made a case of public use, whether by the patentee or another, the burden is then upon the patentee to show, if he can, that the public use was an experimental one. This the plaintiff has failed to do, notwithstanding the belated assertion of inventor Gulick that his 1911 and 1914 uses were experimental only, that being only his descriptive term and does not constitute this an exception to the public use described by the statute. The use may be public although concealed by the nature of the invention itself, as in the corset case, *Egbert v. Lepman*, 104 U. S. 333 (1881).

Plaintiff relies upon *International Telephone v. Kellogg*, 171 Fed. 651 (C. C. A. 7, 1909), where Dean had perfected a telephone transmitter and had used it only for determining its efficiency, and this was held to not be a public use, there being no abandonment; also upon *Reo Motor Car v. Gear Grinding*, 42 F. (2d) 965 (C. C. A. 6, 1930), where there is also an attempt to carry the date back, the inventor was met with a claim of public use, but in this case, as Judge Denison points out at p. 969, the use during all the period was public enough and was in connection with the current sales of the product, but the embodiment of all steps of the combination was not completed and the court concluded that it did not clearly and satisfactorily appear that the effected and completed method was in public use; and also in *Kerner Incinerator Co. v. Townsend*, *supra*, the patentee was still engaged within the 2-year period in modifying and constructing a second device to overcome the difficulties of the original.

Plaintiff urges that mere delay in filing an application on an invention is not abandonment unless some independent inventor intervenes and forestalls the first invention, and relies upon *Hanger v. Rowley*, 298 Fed. 359 (1924). In that case there was no use of the artificial limb by the patentee from three to six years for periods of four months in each year, before he filed his application, and this was not followed by permitting the limb to be scrapped and leaving the structure entirely

out of the application. It would seem that the most that this case decides is that mere delay is not abandonment.

In the case at bar substantial rights intervened before Gulick broadened his claims and brought forward his 1911 and 1914 pistons in 1922. It is true that in the *Mason Jar* case large interests had grown up in the way of manufacture, but the Supreme Court did hold that the patent was invalid, not only on the ground of public use, but on the ground of abandonment. Counsel fail to distinguish between abandonment and estoppel, and if it is believed that there is a conflict between *Hunter v. Rowley, supra*, and the *Macbeth-Evans* case, *supra*, whatever may be said of these decisions there is no question but the rule in this Circuit is the law as stated by the later Justice Clarke's decision, affirmed by the Court of Appeals and quoted with approval by the Supreme Court in *Woodbridge v. U. S., supra*.

There was no adjudication by the Patent Office on abandonment or public use, yet plaintiff urges that the failure of the Patent Office to act is a persuasive or controlling reason in this proceeding, and urges this notwithstanding there is no proof that the abandonment question was ever before the Patent Office.

There is no rule which requires such a holding here, even the rule of comity is hardly applicable. Comity is not a rule of law but one of practice, convenience and expediency, and as Mr. Justice Brown said in a patent case, *Mast, Foos & Co. v. Stover Mfg. Co.*, 177 U. S. 485 (1899) at p. 489:

> "It demands of no one that he shall abdicate his individual judgment, but only that deference shall be paid to the judgments of other coordinate tribunals. Clearly it applies only to questions which have been actually decided, and which arose under the same facts."

And further, in answer to this argument:

> "Comity, however, has no application to questions not considered by the prior court, or, in patent cases, to alleged anticipating devices which were not laid before that court."

Plaintiff relies upon *Gordon v. Walcott*, 42 F. (2d) 55 (C. C. A. 6, 1929), which involved an interference proceedings and patentability had been considered in another suit between the same parties. Gulick may have been "thinking of reduction to practice and not a public use,"

but as in the *Allison v. Ideal Filter* case, *supra*, he made out a public use, and after recess, a case of abandonment; and the Patent Office did not find that Gulick had done "no more than reduce to practice in 1914," for the Patent Office had never passed upon these questions.

If there should be question as to whether Gulick's reduction to use of the 1911 and 1914 pistons was in fact a commercial use, a recent decision gives light on this subject. That the actual construction of the early Gulick pistons in evidence here could not be patented after the falling of the bar of the statutory period, seems elementary, yet such rule has been questioned and was answered in *U. S. Blind Stitch Mch. v. Reliable Mch.*, 67 F. (2d) 327 (C. C. A. 2, 1933). There a heating machine had been claimed in a former application, was rejected by the Patent Examiner and dropped by the inventor. Later another claimed this device and the court held abandonment had occurred more than two years before. Judge Manton said, p. 329: "This constituted a sufficiently clear anticipation by a machine which had been reduced to practice," and cited *Corona Cord Tire v. Dovan Corp.*, 276 U. S. 358 (1928). The question of reduction to practice was considered by the Supreme Court in this case, and Mr. Justice Taft said, p. 384:

> "It is a mistake to assume that reduction to use must necessarily be a commercial use. If Kratz discovered and completed, as we are convinced that he did, the first use of D. P. G. as an accelerator in making vulcanized rubber, * * *. It is not an abandoned experiment because he confines his use of the rubber thus produced to his laboratory or to his lecture room. It is doubtless true that Kratz, by his course in respect to his discovery as to the use of D. P. G., has abandoned any claim as against the public for a patent, * * *."

The court concluded that the first discoverer of the useful accelerator in the vulcanization of rubber was Dr. Kratz and not Weis; so here, Gulick's testimony established his early reduction to use, and so he could not more than two years thereafter claim discovery. This comment omits any consideration of the reduction to use by Monckmeier or of the later uses by Schoengarth and Long.

There is also great significance in Gulick's testimony about his early use of these pistons to the cause of de-

fendants, for proof on this vital point comes from a hostile witness and gives strength to defendants' claims. Of such evidence, Mr. Chief Justice Taft remarked, in *Eibel Coal Co. v. Minnesota Paper Co.*, 261 U. S. 45 (1923), p. 53, it is "a strong case" that is made from the testimony of opposing witnesses.

VALIDITY OF GULICK PATENT IN VIEW OF RIGHTS INTERVENING BEFORE HIS ORIGINAL APPLICATION WAS BROADENED.

The Gulick patent was applied for November 30, 1917, and was issued July 21, 1931. There was also his use of the piston in 1911 and 1914. In this 20-year period many things happened in the improvement of pistons, which industry is bound up with the development of permanent molds in piston making, as replacing the old sand mold.

Packard Motor acquired the Gulick option in March, 1916; its assignment of the patent in August, and the patent application was filed November 30, 1917. His 1911 and 1914 pistons were forgotten, or in any event unmentioned until the Gulick amendment of November 12, 1922.

The independent piston manufacturer won in the controversy with the Aluminum Company of America when the Court of Appeals of the 8th Circuit held, in *Aluminum Company of America v. Sterling Products*, 66 F. (2d) 958 (1933), that there was no infringement in its use of permanent molds to make pistons. Here the distributor defendants urge that the plaintiff, particularly Packard Motor Company, notwithstanding intervening rights of others, so amended the specification and claims as to not only cover what had been in public use and in issued patents, but so as to convert the specification into the very antithesis. The adverse rights intervening relied upon by defendants are the Long pistons used by Franklin dealers as early as 1917, and the Long patent; the Spillman patent of 1919, with the piston marketed by Kant Skore, rights to which were acquired by plaintiff; the Schoengarth patent of 1916; the Moeskmeier piston used in his racing car 1912 to 1916; the Hartog patent of 1920, acquired by plaintiff, and the Jardine and Maynard pistons in use before the radical change in the Gulick specification as amended September 12, 1922.

The file wrapper of the Gulick patent shows his application to describe a specific construction, viz. a piston structure in which the skirt is entirely separated from

the head by a slot extending entirely around, the head being connected to the skirt by webs, and the skirt split between those webs. The original specification emphasized rigidity of the piston, stating one of its objects "to rigidly support the piston pin bosses of a piston from the piston walls," and by further stating the construction provides "an extremely rigid construction between the piston pin bosses and the skirt." After the Hartog patent this wording of the Gulick application was changed and added to so as to make it "flexible" rather than "rigid." This followed the Hartog patent 1,842,022, filed February 16, 1920, and the Long pistons were also on the market at that time. The Gulick application was amended in October, 1921, to cover the Spillman structure which was exemplified in the Kant Skore piston, although plaintiff now says that the Spillman patent structure, which it owns, was worthless. Gulick's counsel further amends in December, 1921, to cover the Schoengarth patent construction, the Long patent 1,395,441 issued two months previously, and Gunn, a Packard engineer, had described the Long piston in "Automotive Industries" of January 29, 1920.

After the Patent Office rejected several claims in January, 1922, Gulick filed an amendment on September 12, 1922, wherein he converts "an extremely rigid connection" between the piston bosses and the skirt of the piston into a "flexible connection." This apparently is in order to strike Hartog and also Long whose pistons had been in service for over two years and were described by Packard's engineer two years and a half before. Hartog, on February 16, 1920, had filed an application for a piston which for the first time disclosed the utility of connecting a skirt with the head through the medium of flexible webs. His application went into interference with Pomeroy, owned by the Aluminum Company of America, and now patent 1,499,073 owned by plaintiff trustee. The Examiner decided in favor of the Aluminum Company but was reversed by the Board of Appeals on August 30, 1922 (Ex. 5-H3). This date is important for within two weeks thereafter, on September 11th, the Gulick application is assigned by Packard to the plaintiff, and on the next day the amendment is filed in the Patent Office, substantially changing the Gulick application.

The amendment contains claims taken from the Long patent and Hartog-Pomeroy interference. There is also a claim to catch the application of the Maynard patent 1,655,968 filed January 3, 1921, now owned by plaintiff,

which Maynard pistons were placed on the market by Maxwell after the Jardine piston had been finished. As before noted, plaintiff later acquired one-half interest in the Maynard patent.

After rejecting several of Gulick's claims, claim 27 which corresponded to claim 10 of the Long patent, was retained and an interference was declared, Gulick having eliminated the "Fulgurite" terminology.

Since the rule of the Patent Office is that where a claim is considered in an issued patent and goes into an interference with a pending application, neither the patentee nor the applicant can dispute the validity of that claim; *Banks v. Ball*, 1887 C. D. 39; *Hermanite-Mejia v. Kelly*, 277 Fed. 699 (1922); *Graves v. Hamby*, 37 F. (2d) 425 (1929); also there is the rule that claims are given the broadest constructions as long as they will "read" upon the applicant's device; *Banks v. Ball*, *supra*; *Lynch v. Hamby*, 295 Fed. 1003 (1923); *Woelm v. Hasselquist*, 62 F. (2d) 305 (1932).

The Patent Office was in this dilemma: the Long patent reads upon Van Bever and Rainforth structures, the patents to Serez (French) and Ebbe, and the office had given claim 10 to Long and it later took the position that it did not involve any invention to split the skirt by Spillman & Messrs and Chenard & Walcker. The Office suggested five claims to Gulick which set out the feature of flexible webs, and this Gulick only accepted with reservation so he was not bound to the statement that patent structure was yielding, leaving it open to be later said that it was rigid. In these controversies Gulick won all the interferences which were not dissolved on account of unpatentability.

In April, 1931, Gulick asked additional amendments to the specifications and claims. Being powerless to dispute the additional claims of the amendment, which now added "another object of the invention is to rigidly separate the piston bosses of a piston from the piston walls," the Examiner thought this covered something the applicant did not have in mind when his case was filed, or at least "which is beyond anything disclosed in his application." Gulick then amended in May, 1931, filing his Supplemental Oath, where it is pointed out that the Patent Office is bound by the higher tribunals, and following this the application was allowed May 16, 1931 and the patent issued in July.

In this situation defendants urge that the Patent Office was misled, and that after a decision by the courts,

Long v. Gulick, 17 F. (2d) 687 (1927), the Patent Office was in a position where it could not refuse to allow the issue of a patent, *Hartog v. Long*, 47 F. (2d) 369 (1931). Defendants urge the intervening rights of Spillman (Kant Skore) and Hartog; that Maynard (Maxwell) and Jardine (Aluminum Company of America) were purchased; that Long was harassed by an interference proceeding and a suit (Ex. 4-Z); that Monckmeier had used his pistons in racing cars, and that Schoengarth had made and sold his pistons.

Defendants urge that there has been such manipulation that a Court of Equity should look with disfavor upon plaintiff's application. The leading case relied upon is *Railway Company v. Sayles*, 97 U. S. 554 (1878). An invention involving a brake system for railways, filed in 1847, laid dormant for five years when it was "considerably modified" and changed after being purchased by Tanner. Reliance was had upon a prior reduction to practice in the fall of 1846, and in the meantime brakes were made by others and had gone into general use. Mr. Justice Bradley said, p. 563:

> "It will be observed that we have given particular attention to the original application, drawings, and models filed in the Patent Office by Thompson and Bachelder. We have deemed it proper to do this, because, if the amended application and model, filed by Tanner five years later, embodied any material addition to or variance from the original,—any thing new that was not comprised in that,—such addition or variance cannot be sustained on the original application. The law does not permit such enlargements of an original specification, which would interfere with other inventors who have entered the field in the mean time, any more than it does in the case of reissues of patents previously granted. Courts should regard with jealousy and disfavor any attempts to enlarge the scope of an application once filed, or of a patent once granted, the effect of which would be to enable the patentee to appropriate other inventions made prior to such alteration, or to appropriate that which has, in the mean time, gone into public use."

The rule that runs through the authorities seems to be that an amendment of something new will not be permitted. In *Webster Electric Co. v. Splitdorf Electrical Co.*, 264 U. S. 463 (1924), the original application of the

Kane patent was filed in February, 1910, and after prevailing in an interference with Podlesak the claims in suit were also made in an application over five years after the issue of the Podlesak original patent. Mr. Justice Sutherland, speaking for the court says, p. 465:

> "It will thus be seen that claims 7 and 8 were for the first time presented to the Patent Office, by an amendment to a divisional application eight years and four months after the filing of the original application, five years after the date of the original Podlesak patent, disclosing the subject matter, * * *"

And further:

> "A comparison of these claims, as set forth in the patent, with the claims in the original application, to say the least, leaves in doubt the question whether they were not so materially enlarged as to preclude their allowance on the original application. *Railway Co. v. Sayles*, 97 U. S. 554,"

The court then continues, p. 465:

> "But this aside, the evidence establishes to our satisfaction that Kane did not originally intend to assert these amended claims, because he considered their subject matter one merely of design and not of invention; and the inference is fully warranted that the intention to do so was not entertained prior to 1918."

As to adverse rights established by the issue of the Podlesak patent, the Supreme Court says, p. 465:

> "During all of this time their subject matter was disclosed and in general use; and Kane and his assignee, so far as claims 7 and 8 are concerned, simply stood by and awaited developments."

The court discusses and distinguishes decisions in reissue cases and copying of claims in interference cases, and concludes, p. 471:

> "Our conclusion, therefore, is that in cases involving laches, equitable estoppel or intervening private or public rights, the two-year time limit prima facie applies to divisional applications and can only be avoided by proof of special circumstances justifying a longer delay. In other words, we follow in that respect the analogy furnished by the patent reissue cases."

The recent analogous case is *Powers-Kennedy Contracting Corp. v. Concrete Mixing & Conveying Co.*, 282 U. S. 175 (1930), which involved a device for mixing and conveying materials, particularly concrete, in which an air pipe was shown for the purpose of agitating concrete and preventing it from packing. The application was filed in 1907, changes were made in the specification, new claims were added in 1911 and expanded in 1913 by assigning to the air pipe the function of impairing movement of the concrete rather than agitation, so as to inject into the case what Mr. Justice Roberts of the Supreme Court called "a so-called slug theory." The change in front appeared thus: the Leake application was filed in the Patent Office nine months after McMichael, the applicant of the patent in suit filed, which applications were thrown into interference; the McMichael interests purchased the Leake applications with the result that both patents were granted, the McMichael in 1915 and the Leake patent in 1917. Mr. Justice Roberts says, p. 185:

> "And, even if the mode of operation is as claimed, it is to be remembered that Leake in his application of October 7, 1907, uses the same words to describe the operation of his nozzles as we find McMichael subsequently inserted in his specifications and claims. When this application came into interference with McMichael's, he, of course, became familiar with Leake's claims. It is significant that he then amended his claims, almost in the very words of Leake. This of itself destroys the patent. *Railway Co. v. Sayles*, 97 U. S. 554; *General Electric Co. v. Sangamo Electric Co.*, 174 Fed. 246; *Lopulco Systems, Inc. v. Bennot Co.*, 24 F. (2d) 510."

Lopulco Systems v. Bennot Co., 24 F. (2d) 510 (C. C. A. 3, 1928), approved by the Supreme Court, involved a method of feeding coal to furnaces, but did not emphasize the so-called "long flame process" for a furnace. More than two years after the filing of the original application and more than two years after a public use, the long flame theory was for the first time injected into the application. The court held that the process was not suggested by the original disclosure and denied relief on the authority of *Railway Co. v. Sayles, supra.*

Where the original application did not mention the possibility of the use of silicates but that feature was added four years after filing, such practice was denied

in *Dwight & Lloyd Sintering Co. v. Greenawalt*, 27 F. (2d) 823 (C. C. A. 2, 1928), Judge Learned Hand saying, p. 828:

> "We decline to accept such obscure references as even premonitions of the matter added later. They are straws at which the patentee now clutches to extend his invention."

In this Circuit the decisions affirm and carry out the principles announced in the above decisions. *Wagenhorst v. Hydraulic Steel Co.*, 27 F. (2d) 27 (C. C. A. 8, 1928), was a case where the original specification as filed disclosed a number of embodiments and one of these later was included in a divisional application which merely amplified the original, but did not change any theory of action. No adverse rights were involved for the claims of the original application covered the interfering as well as defendant's device, and Judge Denison distinguishes the authorities; and in *Wirebounds Patents Co. v. Saranac Automatic Machinery Corp.*, 37 F. (2d) 830 (C. C. A. 6, 1930) he also discusses questions of interfering rights which are not applicable to the situation here, although relied upon by plaintiff.

Michigan v. Sutherland, 29 F. (2d) 179 (C. C. A. 6, 1928), urged by plaintiffs as authority for their position, fails to meet the situation presented on the facts here, for as Judge Knappen there said, if amendments to the patent application "only amplify or explain" what was already reasonably indicated to be invention, the patent is not invalidated. *Reo Motor Car v. Gear Grinding, supra*, also relied upon by plaintiffs, is not conclusive, for there there was no change except descriptive changes in the claims after the appearance of adverse rights, for as Judge Denison says, p. 910:

> "There was no estoppel arising (if it might sometimes so arise) from a failure to claim the broader monopoly until after some competitor has put out a device not reached by the earlier claims. From the beginning to the end of these applications, Ward was constantly seeking a claim which would clearly have covered every one of defendant's different practices."

As to the conduct of inventors and their patent counsel when they see something about to be used in a competing device which they would then include in their original application, as Gulick was also an inventor of

large experience, the language of Judge Denison in *Wagenhorst v. Hydraulic Steel, supra*, at p. 32 is quite in point:

> "If this conclusion were in doubt, it would be confirmed by Wagenhorst's own conduct. The mechanical advantages of this construction, as just stated, were obvious. Wagenhorst was an inventor of large experience in this particular line and was represented by able solicitors. It is not to be doubted that they would have intended to claim every specific invention which they thought present. It did not occur to either of them that the construction shown in Figure 4 involved any invention in this specific respect. It was only when they saw it was about to be used in a competing device, and realized that, if they failed to secure their broader pending claims there would be no infringement, that they concluded there was specific invention in these details of the assembly, and decided to make the specific claim. We think their first conclusion was the right one."

Gulick 1911 and 1914 Pistons not Illustrated or Described in the Patent.

The 1911 and 1914 pistons produced by Gulick do not appear in his application nor in the affidavit of December 24, 1931, nor in the correspondence of Gulick with Packard produced at the trial; and the existence of the 1914 piston was first relied upon in the affidavit of November 8, 1933, while the 1911 piston appeared later. Defendants urge that such situation, together with the fact that Gulick scrapped his 1911 motorcycle block test and Renault car pistons, permitted the 1914 aluminum piston to be scrapped, are reasons which establish that the 1911 and 1914 pistons were actually abandoned; and this is in addition to the fact that they were in public use for more than two years before Gulick filed his application.

To answer this, plaintiff urges that it was not necessary for Gulick to preserve his pistons, illustrate them in drawings or describe them in his specification, because those drawings and specifications disclosed Gulick's earliest embodiment of this invention for what he considered as preferred, and that he was therefore entitled to build claims covering these 1911 and 1914 pistons upon such descriptions and drawings.

The rule appears to be that after a certain structure is described in specifications and illustrated in drawings, the applicant is not entitled to cover all claims and monopolize every way of securing the same result, for as was said in *Electric Signal Co. v. Hall Signal Co.*, 114 U. S. 87 (1885), where Mr. Justice Matthews said, p. 96:

> "But this result or idea is not monopolized by the patent. The thing patented is the particular means devised by the inventor by which that result is attained, leaving it open to any other inventor to accomplish the same result by other means."

To the same effect is *Willett Mfg. Co. v. Root Spring Scraper Co.*, 55 F. (2d) 858 (C. C. A. 6, 1932), and was followed in *Cleveland Tractor Co. v. International Harvester, supra.*

That a claim cannot be taken by itself, but must have a clear foundation in the specification, is affirmed in *Permutit Co. v. Graver Corp.*, 284 U. S. 52 (1931), where a claim was held invalid because there was no basis to show the construction. The structure of the Gulick application and the patent as shown by the evidence in this case, cannot be said to have been a further improvement upon the 1911 and 1914 pistons, for Gulick was not then entitled to put a preferred embodiment in his application and immediately proceed to cover everything for securing the same result, for the Supreme Court has said that cannot be monopolized.

The Sterling pistons, particularly Ex. CCC, apparently approach more closely to the Gulick 1911 and 1914 pistons than does the structure of the Gulick patent. The Sterling pistons have gone into use, while there is no evidence that the structure of the Gulick patent was ever generally used, so that it can hardly be said that the structure of the Gulick application can be considered an improvement over the Gulick 1911 and 1914 pistons.

In another view plaintiff overlooks the fact that the Gulick 1911 and 1914 pistons were specific things as distinguished from what is disclosed in the Gulick application and patents. These pistons, after being tried out to Gulick's satisfaction in 1911 and 1914, and plaintiff is here bound by Gulick's statement, were scrapped and so thoroughly discarded that they do not appear again until November, 1922, over a year after the Long patent 1,395,441 has issued. It would seem that proof of the abandonment of an inchoate right cannot be restricted by

showing the abandonment of things, such as pistons. The reason of such a rule is illustrated by the rule that restriction of a patent may be established during the prosecution by cancellation or amendment of claims, and the leading case is *I. T. S. Rubber Co. v. Essex Co.*, 272 U. S. 427 (1926), referred to hereafter on the question of infringement. Defendants urge that this case is only as to a file wrapper estoppel, but the reasoning seems applicable to the situation presented here.

When Gulick abandoned the 1911 and 1914 piston constructions, actually (as well as by public use), he could not thereafter include them by implication in his November 30, 1917 application. He did not include them, and there is no testimony that he ever told Tibbetts, the Packard attorney who bought the application, about them, and Tibbetts did not include them in the application, for as late as December 24, 1921, the drawing of the application was included in Gulick's affidavit.

GULICK PATENT VALIDITY AS AFFECTED BY MATERIAL CHANGE IN THE SPECIFICATION.

Defendants urge that the specification as filed was changed to something totally different from the original disclosure. This change was made nearly five years after the filing of the application, after pistons embodying the changed construction had been on the market and in public use for five years before the change was made. The adverse decision in the Hartog-Pomeroy interference seems to have been the moving cause for the change.

The original specification states that it "provides an extremely rigid construction," (Ex. 4-L, p. 1839) and five years later the amendment is that the webs or flanges were yielding in character, which was featured as a distinction over Spillman & Moores and Chenard & Walcker. Flexibility of the webs is nowhere mentioned in the original claims, directly or indirectly. Flexibility is relied upon by plaintiff to make out infringement (Tr. pp. 228-9).

Defendants urge invalidity of the Gulick patent, claiming such effect of the amendment to the specifications and claims, since flexible construction of the web is there shown for the first time, and further, that the Gulick patent fails to describe in the specification the metes and bounds of the construction having the required flexibility.

While the decisions of the Patent Office in the several piston cases were affirmed by the Courts on appeal, such

decisions now appear to have been founded upon a misconception of Revised Statute 4888, as were prior decisions of the Federal Courts which were overruled by the Supreme Court in the recent *Permutit Co. v. Graver Corp.*, 284 U. S. 52 (1931). That case involved the lack of disclosure and definition in patent specification and claims as issued. Its decision is based upon a construction of R. S. 4888, which applies to the disclosure and definition in the specification and claims of a patent as filed, as well as to one as issued. Of this statute Mr. Justice Brandeis said, p. 60:

> "The statute requires the patentee not only to explain the principle of his apparatus and to describe it in such terms that any person skilled in the art to which it appertains may construct and use it after the expiration of the patent, but also to inform the public during the life of the patent of the limits of the monopoly asserted, so that it may be known which features may be safely used or manufactured without a license and which may not."

That case had to do with filter beds, and a question arose if a "free" bed might have been valid, but that sued on was invalid for lack of disclosure as prescribed by R. S. 4888. There was no mention in the specification of either "free" or a "locked" zeolite bed, and the court said as the patentee had failed to give in the specification a written description, and had likewise failed particularly to point out and distinctly claim the free zeolite bed, as "the part improvement or combination which he claims as his invention or disclosure," that the patent was void.

The court reviewed the previous decisions on that patent, and the attitude of the courts, including the decisions of the 6th Circuit, 13 F. (2d) 454, 37 F. (2d) 385, and said that such views rested upon misconception, concluding, p. 60:

> "Moreover, while drawings may be referred to for illustration and may be used as an aid in interpreting the specification or claim, they are of no avail where there is an entire absence of description of the alleged invention or a failure to claim it."

The rule of this case has since been applied by the 6th Circuit Court of Appeals in *Bettendorf v. Ohio Steel Foundry*, 56 F. (2d) 777 (1932), affirming his Honor, Judge Hahn, of this District. In that case the alleged feature of the patent was the location of journal bosses

of a railway truck, and this had not been set forth in the claims nor described in the specification. The patent was held invalid as within the prior art. To the same effect are the recent cases *of Anchor Cap & Closure Corp. v. Linhardt*, 56 F. (2d) 542 (8 C. C. A., 1932), involving a jelly jar and cap, and *Helfrich v. Solo*, 59 F. (2d) 525 (7 C. C. A., 1932), where was involved a patent on a cosmetic compact which did not disclose information as to the ratio between kaolin and chalk and the court found that the alleged inventor had failed to disclose in his specifications or claims the novelty on which he relied, and the patent was held invalid.

In view of the statute, neither the specification as filed nor the specification as issued in the case at bar is a compliance therewith. There were no metes and bounds fixed in the Gulick structure, and plaintiff must fail if inherent flexibility is relied upon, as was done in the Patent Office, for both the Spillman & Mooers and the Chenard & Walcker patents meet that issue; and plaintiff having acquiesced in the position of the Patent Office, said that it was within the field of mechanical skill to split the skirts, while the Commissioner seems to have been misled as to the inherent flexibility of the Spillman & Mooers structure as shown by Ex. 3-P, and of the Chenard & Walcker patent as shown by the Ray Day piston.

Plaintiff's counsel rely upon the Supplemental Oath by Gulick as curing any defects in his applications. Such oath is unavailing in the presence of contradicting facts such as are shown in this record, as was said in *Steward v. Ellis v. Lee v. Howe*, 1889 C. D. 243, p. 248:

> "The supplemental oath, in cases where it is effective for any purpose, simply enables the applicant to cover and include in his claim such portion of his original disclosure or description as was not embraced 'in the statement of invention or claim originally presented.' It cannot be permitted in any case to justify such a change as would require an alteration in the date of the application as a completed application."

This rule applies in reissue cases where the reissue application must be supported by an oath. Here the fact that the Patent Office allowed the amendment to be filed is not controlling, for someone might have been mistaken, as seems to have been the fact in the proceedings in this case.

MOOERS PATENT VALIDITY AS AFFECTED BY ATTEMPT TO BROADEN ORIGINAL APPLICATION AND MATERIAL CHANGES IN THE SPECIFICATION.

Defendants urge much the same situation as to the Gulick application is presented as to the Mooers application, where the specification was changed three years after its filing date. Here the attempt was to incorporate the so-called Mooers principle more than two years after the Long piston was on the market, to say nothing of Kant Skore, Maxwell and Jardine.

The Mooers principle is compensation for expansion by mechanical distortion of the skirt, as testified by Dr. Jeffries who would apply it with many ramifications to all Sterling pistons except Ex. 3-J; this was not embodied in the Mooers application as first filed, and first appeared in the amendment to the Mooers specification filed January 4, 1921. After the Mooers patent was assigned to the plaintiff this "Mooers principle" of operation was discovered, and in the meantime the Ricardo patent had been granted, the Long pistons had gone into widespread use, and the art had become familiar with the slipper piston of the Ricardo type (Ex. 3-S) when the application for an amendment of the Mooers application was filed (Def. Ex. 4-L-1, p. 2000). This Mooers principle, therefore, is on the same footing as to the Mooers patent as the flexibility of the Gulick patent, and the reasons heretofore given for finding the Gulick patent invalid because of the extension of the Gulick disclosure apply equally to the Mooers patent which is also found to be invalid.

VALIDITY OF PATENTS OVER PRIOR ART.

Having considered defendants' claims that the Franquist patent was a combination including all that was in the prior art, the next step is to consider the five patents in suit in the light of the prior patents and publications, in addition to the Franquist patent.

GULICK PATENT AND PRIOR ART.

The inquiry is as to the standing of the specific Gulick piston shown in the drawing and described in the specification. The Gulick patent structure comprises a head isolated from the skirt by a circumferential gap extending around the piston below the lower ring land, which is accomplished by connectors extending from the head to the skirt and carrying the wrist pin bosses. Such

connectors are attached in Fig. 1 to the skirt at points just below the wrist pin bosses and then down to near the bottom of the skirt, which attachments above that point are merely longitudinal ribs which have no effect on web flexure. (Stellman, Tr. pp. 530-1, Jeffries, Tr. p. 163.) The skirt is slit in the region between the wrist pin bosses and the structure is such that the webs will flex, although the original specification stated (Ex. 4-L, p. 1838) "the above described construction also provides an extremely rigid connection between the wrist pin bosses and the skirt of the piston."

Defendants urge that this specific structure was not patentable to Gulick, regardless of any extension of supposed patent monopoly, to cover the Sterling and Ray Day pistons.

Franquist has a disclosure of a piston which is adapted to have a snug, sliding fit in the cylinder when cold, which upon expansion of the piston, automatically yields sufficiently to prevent its sticking in the cylinder; and the partial isolation of the head from the skirt, as accomplished in the Sterling pistons; and thus the sole distinction is that in place of provision for contraction by partially slotting the skirt vertically, in Gulick the vertical slotting is all the way through the skirt, and specifically, there is a single slot midway between the wrist pin bosses and connecting with the vertical slot.

Apparently the placement of the slot exactly in the center was not a criterion as far as the Gulick patent was concerned. (Jeffries, Tr. p. 175.) Slotting through piston skirts was not only old, as shown by the Ebbs patent of 1902, the Van Bever, Bainforth and Serex patents of 1912 the Vincent patent of 1913, and the Schoengarth patent of 1915, but there is also a cutting through of the vertical slot in the Long patent of 1918 and 1919, the Spillman patent of 1919, the Hives and Jardine patents of 1920, the Maynard patent of 1921, and the Ray Day application of 1923. In this connection there is the piston ring which is slit through, admittedly ancient by the experts (Jeffries, Tr. pp. 94-6, and Stellman, p. 477), and the ancient use of expansion joints. Stellman considered slotting no particular trick (Tr. pp. 480-1) when he made Ex. B at Franklin in 1916, and he did that when ignorant of the Van Bever patent (Tr. p. 583).

Plaintiff's claim covering a T-slot to a trunk piston was allowed in an interference with claim 10 of the Long patent 1,395,441, which was allowed to Gulick as

claim 13 (Defendants' Ex. 4-F). Thus neither Long nor the Patent Office could dispute its validity, which was afterwards affirmed by the Court of Customs and Patent Appeals. The hands of the Patent Office were thus tied in which is now urged to be an unpatentable subject-matter, and the Patent Office was in no position to controvert this after the grant of the Long patent.

Considering also the connections from the head to the skirt, the only difference between Gulick and Spillman & Mooers is that the connection in Spillman & Mooers is made at the bottom of the skirt and in Gulick the attachments are along the skirt; and this the Law Examiner held to be no patentable distinction (Defendants' Ex. 4-E). It is urged by plaintiff's counsel that Spillman & Mooers' patent structure has not gone into commercial use, although it is one of the patents relied upon as infringed in the *Simmons* case, *supra*.

The same situation arises from the Chenard & Walcker patent as the Spillman & Mooers, for the Law Examiner (Ex. 4-C) uses either patent as a basis, and held it involved nothing but mechanical skill to split the skirt.

As against the Gulick patent, the defendants claim:

(1) That Spillman & Mooers showed the separation of the head from the skirt, which was all that was required in a cast iron piston, and that Spillman & Mooers, before its expiration, was relied upon by plaintiff as covering the accused device (Ex. 1).

(2) That Franquist contributed the separation of the head from the skirt, slotting the skirt longitudinally to obtain a piston having a snug, sliding fit when cold, which upon expansion of the piston when hot would automatically yield sufficiently to prevent sticking; this patent was also relied upon by plaintiff before its expiration, sued upon and royalties collected.

(3) That the Franquist invention gave a broader idea than the later Gulick patent, i.e., in addition to the isolation of the head from the skirt, the head is diametrically reduced to the circumferential slots and the reliefs in the region of the wrist pin bosses extend from bottom to top so as to merge into the diametrical reduction of the head with the slots.

(4) That splitting through the skirt of the piston vertically was practiced from 1902 to 1923, and T-slots came in 1912.

(5) That the decisions of the Patent Office held that it involved nothing but mechanical skill to split the skirts of Spillman & Mooers and Chenard & Walcker and to arrange the webs as in the Gulick patent.

Gulick claimed rigidity of his piston, yet as Associate Judge Bland said in the patent appeal of *Hartog v. Long*, 47 F. (2d) 367 (1931), "that Hartog's piston skirt has more flexibility than Gulick's, and that the elements responsible for such flexibility in Hartog differ materially from the elements responsible for it in Gulick cannot be denied." The court denied the Hartog claim on the ground that he sought to read into the count things suggested in the specification, but not embraced within the language of the count. The court then goes on to say that it seemed clear if the slot of the Gulick piston takes care of expansion, it is by reason of its flexibility, and finally awarded Gulick the claim. The court then concludes that Gulick should be regarded as prior inventor of the subject-matter, if he had the right to make the claim which was not denied in that court. The pertinency of that language here is that in this proceeding there is denial accompanied by proof that Gulick has both abandoned and is not the prior inventor of a piston with a skirt that flexes or yields.

The legal question is thus presented regardless of the decisions in the Patent Office acquiesced in by plaintiff, does it involve invention on the part of Gulick to take old pistons such as Spillman & Mooers or Chenard & Walcker and split the skirts of those pistons in the region of the wrist pin bosses?

Invalidity or Lack of Invention.

Where the patentee had gone to another art to supply an expedient, it was not held to be a departure, and hence not invention. In the present case Gulick stayed in the same art, namely, pistons. In *Crown Cork & Seal Co. v. Sterling Cork & Seal Co.*, 217 Fed. 381 (C. C. A. 3, 1914), was involved a patent for automatically sealing bottles by forcing a cap thereon. A previous patent granted on the same application of the patentee had partially solved the problem, which provided a yielding connection between the Pitman and the plunger engaging the cap to force it on the bottle. That situation corresponds to this, in that the skirt of the Franquist piston is later slotted so as to be permitted to contract when the piston gets hot. In that case the plaintiff relied upon an im-

provement, and the applicant having gone to another art, substituting a yielding arrangement upon the previous patent, and of this Judge Denison says, p. 385:

> "The conception which lay at the bottom of plaintiff's 1898 patent, viz., that he could go to the yielding plunger art, or to some specific art, and adopt a yielding plunger as an element of a bottle-sealing machine, was a meritorious conception. It may have entitled him to a broad monopoly upon any use of a yielding plunger in that association (as was apparently secured to him by the first claim of his 1898 patent)."

He then continues in discussing the situation before the court, p. 385:

> "That question is not before us, and we do not mean to intimate any opinion; but, however that may be, having had this conception on 1898 and having received a patent, he could not have another patent in 1899 which would do more than cover the improvement which he then discovered."

Judge Denison then states the reason for the unsoundness of such a procedure as follows, p. 385:

> "Having gone into the yielding plunger art, and adopted and adapted the hydraulic cylinder yielding plunger into and for a bottle-sealing machine, and having thus bridged over whatever gap there was between bottle-sealing machines and yielding plungers, and having thus incorporated the two arts together, he could not the next year adopt a mechanical trip-yielding plunger to bottle-sealing machine use and then get a valid patent covering any kind of a mechanical trip-yielding plunger when used in a bottle-sealing machine. Yet this is, in effect, his present position, and must be his position to succeed. There remained open for his 1899 patent only his adaptation, not his adoption."

He then quotes with approval the decision of Judge Killits in the District Court as follows, p. 385:

> "'But, when Painter patented the mechanism alleged to be infringed in this case, the art of bottle-sealing by crowns had already invaded the art of yielding pitman, of which the known forms were many, and had made an appropriation therefrom.

> Whatever may be the merits of his invention, we find nothing in his grant which shuts the door of opportunity to some other inventor to go to the yielding plunger art for an old device of this character'."

While it is elementary that invention may reside in a combination of elements which were theretofore separately old in the art, in order to sustain such combination the inventor must do more than make a judicious selection from the devices of the prior art. Merely doing this, as said by Judge Hickenlooper in *Newcomb, David Co. v. Mahon Co.*, 59 F. (2) 899 (1932) at p. 901, "is the exercise of mechanical skill reasonably to be expected in the development of the art, and has repeatedly been held insufficient to evidence invention, whether such decision be placed upon the ground of aggregation or upon the lack of an exercise of an inventive faculty," citing *Concrete Appliances Co. v. Gomery*, 269 U. S. 177 (1925). In another decision by Judge Hickenlooper, in *Bettendorf Co. v. Ohio Steel Foundry Co.*, 56 F. (2d) 777 (C. C. A. 6, 1932), the court said, p. 778:

> "It would require no exercise of the inventive faculty merely to combine these desirable and well-known elements of the prior art structure—especially under the stimulus of newly adopted standardization requirements."

And further, p. 779:

> "But, after all is said and done, there still remains the question of fact whether the patent discloses an exercise of the inventive faculty, in view of the state of the art, or merely mechanical skill; and the question of law, whether the claims properly protect the patentee in the invention which he has really made."

While it is within the province of the court to decide this case on the ground of non-infringement, as was the result in *Crown Cork & Seal Co. v. Sterling Cork*, supra, the facts here seem to warrant going further and holding that the claims on the Gulick patent are invalid as in the last case cited. Other cases to the same effect in this Circuit are *Oil Conservation Engineering Co. v. Brooks Engineering Co.*, 52 F. (2d) 783 (1931), *Sands Mfg. Co. v. Smith*, 53 F. (2d) 459 (1931), and *Rhame, Inc. v. Sparks-Withington Co.*, 58 F. (2d) 583 (1932). The Supreme

Court early so held in a case, *Thatcher Heating Co. v. Burtis*, 121 U. S. 286 (1887), involving the use of the old fuel magazine in a particular base burner, where Mr. Justice Matthews said, p. 294:

> "When this fuel magazine was thus transferred from one kind of stove to another, in its new situation it performed precisely the same function, with respect to the fuel and the fire, as it had always been accustomed to perform in its old place * * *"

and this was followed in *Thomson Spot Welder Co. v. Ford Motor Co.*, 265 U. S. 445 (1923), where the Supreme Court approved the language of the Court of Appeals of this Circuit, and said, p. 451:

> "Although invention is not necessarily negatived by the fact that each element of the combination is old, the question of fact whether the combination itself involves invention in view of the prior art is always present."

A recent holding of lack of invention appears in *Naivette, Inc. v. Bishinger*, 61 F. (2d) 433 (1932), where a re-issue of patent to Decker on permanent waving had been held valid and was reversed by the 6th Court of Appeals, Simons, Judge, saying at p. 437:

> "We fail to see invention in Decker. He combined old elements, but manifestly in such a way as must have been obvious to anyone skilled in the art, and the combination produced no new result. If what he did marked any improvement in the art, it solved no real problem and answered no recognized need, and such advance, if any, as was achieved was altogether too trivial to rise to the dignity of invention. *Seymour v. Ford Motor Company*, 44 F. (2d) 396."

Jardine Patent and Prior Art.

The inquiry is as to whether the specific structure shown in the Jardine patent amounts to invention in view of the prior art. Defendants urge that plaintiff takes another type of piston, a slipper piston as shown in Jardine, being specifically that of the Ricardo patent No. 1,294,833, and upon this would uphold another patent for a split slipper piston.

Testimony at the hearing showed that Jardine is also the basis of Maynard, and that to Jardine Maynard

merely added an oil wiping ring at the bottom. The testimony showed that Jardine knew of the Ricardo piston and its development; that it was tried out by the Aluminum Company of America, and plaintiff's expert produced a Ricardo piston on rebuttal. An exemplification of Ricardo piston was shown in the publication of "Automobile Engineer" in 1918 (Ex. 3-S), which piston had been tried out by plaintiff, so that there is no basis for surprise in this proof which was not pleaded in the answer. Comparison of the Jardine and Ricardo pistons shows that both are slipper pistons, being distinguished in that Jardine split both slippers, which practice was known to the prior art from Ebbs in 1902 to Long in 1919.

The webs of Ricardo are thinned down, which plaintiff claims was already done by Gulick in his patent disclosure. While the webs of Ricardo are thinner than those in the Jardine patent, the difference seems to be one of degree. The isolation of the skirt from the head goes all the way around as in the Spillman & Mooers and Chenard & Walcker patents, and as in Franquist considering the slot as going all the way around as a part passes through the air. The form of the slippers of Jardine are appropriated from Ricardo in making one slipper longer and wider than the other. There was considerable evidence that the Jardine piston is simpler, lighter and cheaper than Gulick, which is due to its being a slipper piston. The statement of plaintiff's expert that Jardine was the first single wall piston to flex overlooks Franquist in view of the tests and the testimony in this record. Jardine pistons were never sold, have never gone into commercial use, although plaintiff's expert says that the Ricardo piston was used in Europe. Plaintiff's claim is that Jardine was followed by Maynard, a better piston, which was developed by Maxwell.

The Jardine piston seems to be invalidated by the Ricardo piston which was known to Jardine when he started to work on it, and the slitting of the slipper piston of Ricardo by plaintiff's assignee, as Gulick had done with the Spillman & Mooers piston, fails to show any inventive effort. The discussion of the authorities in *Crown Cork & Seal Co. v. Sterling Cork*, *supra*, and the cases there cited, are to the same effect.

Before Jardine filed his application, the Long piston was on the market for perhaps three years. Long's application for patent No. 1,872,772 was in interference with Jardine, involving claim 5 of the Long patent, the

decision was adverse to Jardine, so the Jardine patent if valid is valid to cover only the exact invention disclosed, for the Jardine claims relied upon are invalid in view of the Long pistons, the applicable rule of the patent law being that which if later will infringe if earlier will anticipate. The claims of the Jardine patent relied upon are invalid in view of the Long pistons.

MAYNARD PATENT AND PRIOR ART.

This inquiry is as to the standing of the specific Maynard piston shown in the drawing and described in the specification. Besides the patent stating that this invention relates to pistons, Maynard says (p. 1, l. 2) that the patent "has for its object the prevention of the 'pumping' of oil and the 'freezing' due to excessive expansion."

Defendants urge that through Maynard plaintiff is attempting to monopolize the application of the same old split piston with its dashed-in relief, with its head diameter reduced, and with an oil groove, all claimed to be old in the art. Defendants are not limited to the dashed-in relief, for plaintiff contends that the other Sterling pistons with relief (Exs. BBB and CCC) come within the scope of the Maynard patent.

Maynard admits the employment of the old expedient of longitudinally slotting a piston skirt, in the specification (p. 1, ll. 16 *et seq.*), and would add thereto an oil groove between the piston ring portion and the skirt portion which is called "a continuous annular groove." A smaller recess for the "film of oil around the piston" was described in the Howe patent 908,569, and which use had been followed by licensee of that patent (Tr. pp. 1067-8). The slotting described in the Maynard patent was in quadrants, leaving one-half of the groove in the air, and the only language of the patent about the web structure and splitting which is claimed to be equivalent to a relief, is p. 1, ll. 60, *et seq.*, concluding:

> "Thus there are formed recesses H surrounding the bearings G with segmental skirt portions on opposite sides thereof and an annular skirt portion below said segmental skirt portions,"

and with reference to function they have stated as follows:

> "Any oil accumulating in the recesses H will follow down the webs F and there is no chance at any

point for the accumulation of oil adjacent to the rings."

Any reference to flexing of the skirt is omitted from the Maynard patent. Claim 6 is for a combination of a head, webs, a skirt integral with said webs "relieved adjacent said webs to a point between the bosses and the end of the skirt," and circumferential and longitudinal slots. The reliefs are not dashed-in but are similar to the reliefs of Franquist. Nowhere in the patent is there any statement about Keystone relief, found necessary to make function commercial pistons like Exs. 1 and 17.

The plaintiff's expert testifies that Maynard is a commercially successful piston, combining a number of features (Tr. pp. 77, 121-2). Maynard does combine a number of features, namely, a trunk piston having the expedients of the prior art, to which has been added in practice a Keystone relief not disclosed in the Maynard patent. Defendants claim that without such Keystone relief the Maynard piston is not a commercial success, and the proof offered by plaintiff that the Maynard piston operates successfully without the relief is not convincing.

Maynard was on notice as to what preceded him, for there was the Jardine piston and the Long piston. Plaintiff's expert testifies that after the test of the Jardine piston on a Maxwell car, Maynard being Chief Engineer of the producing company, "this Maynard development came along * * * and the Maynard piston is the one that was adopted in the car." (Tr. pp. 131-132.) Plaintiff's expert says that Maynard is like Jardine except that the skirt is completed at the bottom and Maynard added the old oil wiping ring (Tr. pp. 77, 137) which was shown in the Schoengarth and Roots British patent, that Maynard went back to Schmiedeknecht, for both Maynard and Schmiedeknecht followed the Ferry British patent, that the Maynard piston is like the Jardine from the boss up, and like Schmiedeknecht from the boss down; and finally that the commercial piston (Ex. 17) is like Jardine from the boss up and like Gulick from the boss down, and differs from the unslotted Ricardo in that Maynard has a wiping ring at the bottom.

Coming to the operation of the Maynard piston, it appears that the top was not sufficiently flexible to compensate for all expansion, which is secured in the commercial piston (Exs. 1 and 17) by the Keystone relief not shown in the patent. While two rough castings were

produced without the Keystone relief, the record shows that after the filing of the Maynard patent application, change was made to give the Keystone relief (Ex. 22). So the piston before the court is the piston of the Maynard patent which is without the Keystone relief. A significant fact is that Chrysler abandoned the use of the Maynard piston although owning a half interest in the Maynard piston (Tr. p. 130). The Franquist piston is a complete answer to the Maynard piston, for it shows the structure, function and mode of operation of the Maynard patent, as is the Long patent 1,395,441 which was tested by plaintiff's witness, Burns, at Franklin as early as 1918, and Stellman says (Tr. p. 525) that all Maynard did was to put the T-slot of Long on the piston of Schmiedeknecht.

Finally it must be said that plaintiff cannot even rely upon an alleged copying of the Maynard piston by defendants, in view of the failure of the patent to disclose an essential feature necessary to make it work, that is, the Keystone relief, for as said by Judge Hickenlooper in *Bettendorf v. Ohio Steel Foundry Co.*, 56 F. (2d) 777 (C. C. A. 6, 1932), at p. 779:

> "Clearly if the claims as stated fail to disclose a patentable invention, no license is required, the device may be used and made by anyone."

The Maynard patent represents a collection of old expedients, each employed in the usual capacity, which the courts have consistently refused to recognize as a patentable combination. Similarly, a valve patent was recently held invalid in *Central Brass Mfg. Co. v. Republic Brass Co.*, 63 F. (2d) 287 (1933), where Judge Hicks said, reversing His Honor Judge West of this District, p. 289:

> "Spaced interior partitions with aligned ports, angular passages, and hollow sleeves having lateral ports communicating therewith are all admittedly very old in valves relating to the plumbing art. Bloch was chargeable with knowledge thereof, and we think that the introduction of these elements into his combination was an obvious one. Acting upon his knowledge, skill and experience, he simply took another step in the evolution of the bathtub and shower art. He produced a cheaper, more compact, and perhaps a more convenient valve; but we do not think that his achievement was the result of the exercise of the inventive faculty."

Mooers Patent and Prior Art.

As to this patent, a similar situation is presented as to the three preceding patents. Plaintiff owns the Spillman & Mooers patent; in fact, the Spillman & Mooers patent was the foundation of the original trust agreement, to which was added this Mooers patent. Under Spillman & Mooers, royalties were collected until its expiration, and it was one of the patents in the suit of *Cleveland Trust v. Simmons Mfg. Co.*, hereinbefore considered. Following the expiration of the Spillman & Mooers patent it is now disowned by plaintiff as being impractical.

Mooers states in his specification (p. 2, ll. 99 *et seq.*) that the construction of the piston embodying his improvements may be carried out in permanent molds, which was not true of a construction for the old patent, and that he had in mind the use of permanent molds in the design of his improvement. When the Spillman & Mooers patent was issued in April, 1914, the patent molding process had not been developed, so that with the advent of permanent molds there was a requirement of ready extraction of the core from the mold. Plaintiff's expert admits this particular piston never went into commercial use (Tr. p. 114), that it was not satisfactory (Tr. p. 107), has no skirt flexibility, is inferior to the construction of Gulick and Jardine, and claims for the patent that it discloses relief adjacent to the bosses and permits mechanical distortion and was the first to compensate for heat by distortion.

The Spillman & Mooers patent seems to be a complete answer to this Mooers patent, for Mooers went back to the construction of Franquist by having the connection of the head to the skirt raised and eliminating the attachment made at the bottom of the skirt. This was a compromise between he efficiency of heat transmission and efficiency of operation, and a similar practice was said by the Patent Examiner in the Gulick interference (Ex. 4-E, pp. 1661-1662) as requiring no inventive effort.

Plaintiff urges that the claim reaches the Ray Day piston for the connection is from the head to the wrist pin boss, and urges that the Ray Day piston thus infringes the Mooers patent. Neither the patents of Spillman & Mooers or the Chenard & Walcker patents show reliefs in the region of the wrist pin bosses, although prior to both, pistons had been relieved in the region of the wrist pin bosses. Relief was accomplished by oval

grinding, as now shown in the Plymouth piston (Ex. 3-O), and which expert Stelhman says is described in the Chenard & Walcker patent. So the question arises, if reliefs in the region of the wrist pin bosses by oval grinding was not sufficient, and separation of the head from the skirt was not sufficient, does it constitute invention to use both features in one piston, which seems to be what has happened with the Ray Day piston as regards the Mooers patent.

On the basis of the authorities heretofore cited, such combination cannot be invention, for the next might combine separation of head from skirt with oval grinding and simple relief; another might add a tapering of the skirt, to say nothing of other combinations which might be offered.

Considering the Sterling piston, the Franquist patent is a complete answer to Mooers, as is the Gulick 1914 piston (Ex. 51), except the two connections inside the piston and the absence of relief opposite the wrist pin bosses, which Gulick carefully said his early piston did not have.

Plaintiff having made reference to the Mooers patent a clear issue in this case, by contending that the accused devices infringe, and from the constructions it appearing that as far as the Mooers patent is concerned the accused devices are in the public domain, the claims of the Mooers patent relied upon as infringed are found to be invalid and void.

Schmiedeknecht and Prior Art.

This patent was acquired by the plaintiff after several transfers from the Bohn Aluminum & Brass Corporation for an interest in the trust estate. Ex. 1 is the only accused device as to this patent. With the advent of aluminum and the consequent difficulty of securing a proper fit, this invention is put forward as a light weight cast iron piston, apparently to obviate the difficulties arising from aluminum pistons (p. 1, ls. 35-46).

The specific construction of the patent provides a piston in which the weight is reduced by cutting holes in the side walls, and would replace the previous practice of mounting wrist pin bosses on the side walls by the use of ribs or webs. To obviate the necessity of thickening the walls of the piston, Schmiedeknecht proposes webs on the inside of the piston and supporting the bosses each at one end from the web and at the other end from the head (p. 1, ls. 97-107, p. 2, ls. 4-12).

Ex. 1 does not employ the Schmiedeknecht construction but supports the wrist pin boss intermediate its end. The construction of Schmiedeknecht is exemplified in the prior art by the Pugh British patent, where each boss is supported at its end from a cross-web extending to the head of the piston. Also, the Ferry British patent more nearly approached Ex. 1, for there the bosses are wholly supported by cross-webs.

Here again Ex. 1 follows the prior art more closely than it does the Schmiedeknecht construction. Plaintiff makes the issue by contending that a construction in which the boss is supported intermediate its ends, is the equivalent of a boss supported at the ends, and in view of the prior art, the finding is that the Schmiedeknecht patent is invalid and void.

PRIOR USES.

To establish prior use, defendants offered evidence of pistons made and used by Monckmeier in his racing cars as early as 1911, the pistons made and sold by Schoengarth in 1915, and the pistons made and sold by Long before May, 1916. If established, such prior uses by Monckmeier and Schoengarth constitute a statutory bar against the plaintiff's claim on the Gulick patent. Prior uses as affecting the other patents in suit is also to be considered.

Monckmeier Pistons.

Defendants offered in evidence proof of the existence of the Monckmeier piston from 1911 to 1916, producing the two pistons involved, a cast iron piston (Ex. 3-D) and an aluminum piston (Ex. 3-W). Monckmeier is a business man now engaged in the manufacture of tools and automobile appliances, and when racing Staver cars, slotted and used the pistons produced at the trial. Three additional witnesses were called, a mechanic who did machine work for Monckmeier on the 1911 piston, another now in the automobile repair business, who helped Monckmeier put the 1915 pistons in his car before the Elgin race when they were first used, and another in the manufacturing business in Chicago, who helped Monckmeier install the aluminum piston in his car in the early fall of 1914, before the Iowa City race and again saw the pistons before the Anamosa race of June 10, 1915. These witnesses were wholly disinterested, none were in the business of marketing or producing pistons, and by his

own use, Monckmeier is barred of securing any patent rights.

Monckmeier testified he had the cast iron piston in his possession since 1912 after he had slotted it at Peoria, and had the aluminum piston since 1914. Both were used in races of which he testified, and to corroborate, magazines and newspapers were produced, checking the dates and showing that he competed in the races as he had orally testified, in several of which he won prize money.

After the recess plaintiff brought other witnesses who had known Monckmeier and of his racing, and whose testimony varied in details but in no substantial way discredited the facts as to Monckmeier's manufacture and use of the pistons in the races on the dates before established.

The construction of these old pistons is established by their production and offer in evidence, so there is no question about relying upon oral recollection as to the nature of such construction, such as was considered in the *Barbed Wire case*, 143 U. S. 275 (1892). In that case the court said that "the proof shall be clear, satisfactory and beyond a reasonable doubt," and recently the Supreme Court, in *Eibel Process case*, 261 U. S. 45 (1923), Mr. Chief Justice Taft said, at p. 60, "that the evidence to prove prior discovery must be clear and satisfactory," but in each of these cases no original device was produced. Here not only are produced the original pistons described by three corroborating witnesses, but the dates of use are checked by public documents, newspaper and magazine articles, together with a record of a private contract.

A similar question was presented in *Cleveland Tractor v. International Harvester*, Equity No. 3860, where the decision of this Master was affirmed by his Honor, District Judge Jones, on March 25, 1933. The same authorities there cited are pertinent here, for there was involved a power take-off mechanism which had been used on a tractor in 1910, some three years prior to the application for the Strait patent. What was said in that case is quite in point here, and the following is from pages 37 and 38 of the Master's report:

> "The courts have not forbidden the defense of a prior use in a patent case or the proof of such use by a paroled evidence. The question in each case is one of fact to be decided, whether the evi-

dence which has been produced by the defendants proves the existence of the alleged prior use. If the device is simple, if the witnesses are apparently honest, if the circumstances are such as to have properly impressed the event upon their minds and memory, and particularly if they are familiar with the subject matter of the alleged invention, such prior use may be established by parol evidence. An early case discussing the evidence of prior use and hold a patent invalid is *Sipp Electric & Eng. Co. v. Atwood Morrison Co.*, 142 Fed. 149, where a discussion of such evidence appears at pages 153-5."

"Cases of prior use are summarised and discussed in *Haggerty v. Rawlings Mfg. Co.*, 14 F. (2d) 928; which involved a patent relating to guards or pads for use in football suits. The evidence of prior use was the verbal testimony of four witnesses that it was common custom to make devices similar to the patented invention prior to the application for patent. Other cases, *Chrone v. John J. Gibson Co.*, 247 Fed. 503; *Lee v. Upson & Hart Co.*, 43 Fed. 670; *Rochester Coach Lace Co. v. Schaefer*, 46 Fed. 190; *Groupe Drier & Boiler Co. v. Fiske Geiger, et al.*, 215 Fed. 110."

"Upon the strength of parol testimony of a prior use a patent for disk plows was held invalid in *Linville v. Milberger*, 29 F. (2d) 610. As to such use of the implement, Judge McDermott said (p. 617):

> 'but, no one, I believe, can read the evidence of these seventeen persons, with their wealth of homely methods of fixing the dates with checks and bank records supporting the story, with different witnesses identifying one part of the plow he had fixed and another witness another part and have any vagrant suspicions that they are perjurers. In short, the evidence meets the exacting standards required and is supported by the appearance of the plow itself'."

This last case was affirmed by the Court of Appeals of the 10th Circuit, 34 F. (2d) 390 (1929), and in the opinion of Judge Phillips repeats with approval the above language as to prior use establishing the defense of invalidity.

Plaintiff urges that the pistons of the patents in suit are for use on pleasure cars and that Monckmeier's use on a racing car was simply an experimental use. The Supreme Court did not accept such a view in the famous corset case, *Egbert v. Lippmann*, 104 U. S. 333 (1881), where only the fiancee of the inventor had used the device and this was more than two years prior to the application, which the court held to be a use and not an experiment.

Plaintiff urges that the use by Monckmeier amounted to nothing more than an abandoned experiment; that the Monckmeier use of pistons in 1911 is not to be considered an abandoned experiment is established in *Buser v. Novelty Tufting Machine Co.*, 151 Fed. 478 (6 C. C. A., 1907), where a small tufting machine had been used prior to 1886, was not used in 1886 and 1887, when the 2-year period began to run; the court held that it was immaterial whether it was used until during the eleven year period before the patent was applied for. If once used as a completed invention, that is enough in distinguishing between the public use of the statute and abandoned experiment, Judge Cochrane says, p. 492:

> "These two things are entirely distinct, and in argument the distinction between them is not clearly noted. In order that it may be, we will consider them one at a time in relation to said position. An abandoned experiment is an experiment that has been abandoned. As a mere experiment never amounts to anticipation, the epithet abandoned here is unnecessary. What constitutes an experiment is indicated by the language of Mr. Justice Swayne in the case of *Coffin v. Ogden*, 18 Wall. 120, 21 L. Ed. 821:
>
> "The invention or discovery relied on as a defense must have been complete and capable of producing the results sought to be accomplished. If the thing were embryotic or inchoate, if it rested in speculation or experiment, if the process pursued for its development had failed to reach the point of consummation, it cannot avail to defeat a patent founded upon a discovery or invention which was completed, while in the other case there was only progress, however near that progress may have been approximated to the end in view. The law requires, not conjecture, but certainty. If the question relate to a machine

as thus exhibited, the conception must have been clothed in substantial forms, which demonstrate at once its practical efficiency and utility.' "

And again:

> " 'Until his work is done, the invention gives nothing to the public.'
>
> "If, however, the machine or other thing is complete, and capable of producing the result sought to be accomplished, it has passed the experimental stage and becomes an invention; and, in order that it may constitute an anticipation, it is immaterial how well it becomes known or how much it is used."

Where a device was only used for two and one-half months this was sufficient "public use" to bar the grant of a patent to another filed more than two years later, *Brush v. Condit*, 132 U. S. 39 (1889) where one clamp and lamp device had been used in work in a mill at night, in and out of doors. Such use was not experimental, and Mr. Justice Blatchford said, p. 47, it did not seem to be for the purpose of testing the machine, of calling attention to its qualities or of gratifying curiosity, but was used to furnish light to workmen. Here Monckmeier used his piston in a car used to win races, for which he was paid money.

Even a limited use of a device is sufficient to bar a patent, as Judge Tuttle said in *Eclipse Interchangeable Counterbore Co. v. Gairing Tool Co.*, 33 F. (2d) 942 (1929), at p. 943:

> "What was done at Mansfield was not published, was not patented, and the amount that it helped the world, of course, was pretty limited. But so long as I find, as I do, beyond a reasonable doubt, that it was done, that it was used, and with mechanical success sufficient to bring it into the art, I am forced to consider it."

Plaintiff also urges that the Monckmeier pistons, constructed and slotted as shown in the exhibits, would not operate to satisfaction in the present day automobile, and of course no piston does that. The piston of the Gulick patent did not, nor would the Gulick 1911 and 1913 pistons, but what was embodied by Monckmeier and by Gulick in the 1911 and 1914 pistons is now open to the public, even if old devices might now seem impracticable.

They must be considered a prior public use of what they actually embody, regardless of their efficiency, if used in this day. The same question was before the Court of Appeals in *Motor Improvements, Inc. v. General Motors Corp.*, 49 F (2d) 543 (1931), also involving some five patents on purolator or oil filtering devices, where it was established that the old Royal Tourist car used an oil filter which was described as impracticable, still it was a prior use of oil distributing pipes and of undoubted efficiency, which feature Judge Mack held was good and constituted a bar to a subsequent patent on that particular feature. In the same way the T-slot expedient broadly claimed to be covered by the Gulick patent, was used not only by Gulick but by Monckmeier and Schoengarth more than two years before Gulick's application. To the same effect on this point is *Eclipse v. Gairing Tool Co.*, *supra*, and *Kil-Nock v. Chicago Plating Co.*, 10 F. (2d) 536 (D. C. Ill 1926), where Judge Lindley says, at p. 538:

> "When it clearly appears that a prior device is in all essentials the device of the patent, and in fact accomplished practical work and was put to ordinary use, anticipation is made out, though the anticipatory device did not operate as perfectly as that of the patent, and was not long kept in use. *Brush v. Condit* (1889), 10 S. Ct. 1, 132 U. S. 39, 33 L. Ed. 251; *Id.* (C. C. 1884) 20 Fed. 896."

Plaintiff urges the precedent of several cases in which the evidence of prior use has been held insufficient and sets up a yardstick as to how the proof in this case should be measured. The authorities offered present not an instance where the alleged device alleged to have been in use is offered in evidence by the prior user. In *United Shoe Machinery Corp. v. Day Wood Heel Co.*, 46 F. (2d) 897 (C. C. A. 6, 1931), and also *Union Trust Co. v. White Motor Co.*, 22 F. (2d) 898 (1927), although there was a signed and dated drawing, Judge Westenhaver pointed out that the other circumstances of the proof were such as to cast doubts upon the integrity of the drawings but also of the witnesses; and in *Universal Rim Co. v. Firestone Steel Products Co.*, 289 Fed. 884 (1923) urged by plaintiff, only oral evidence was submitted.

On the other hand, there is *Open Hearth Steel Furnace Co. v. Youngstown Sheet & Tube Co.*, 2 F. (2d) 94 (1924), where there was testimony of several prior uses

at different places, and Judge Westenhaver said, p. 97, "even if they are to be regarded as abandoned experiments rather than discontinued inventions, they should not be denied a place in the open hearth furnace art; each will be considered as a part thereof." Such situation is quite comparable to the facts of the present case, where the T-slot expedient has been shown to have been used by many persons other than Gulick, and including Moseknmeier, Schoengarth, Long and others, working independently and all resorting to the same expedient upon encountering expansion difficulties in their pistons.

Schoengarth Pistons.

Defendants offered in evidence the Schoengarth pistons, urging that this showed (1) the public use of that piston for two years prior to Gulick; (2) another use of the old T-slot expedient more than two years prior to the Gulick amendment of September, 1922; (3) how another mechanic put an adjusting device on a piston with a T-slot or left it off, depending upon the character of the cylinder; and (4) another instance of intervening rights years prior to the said amendment.

Schoengarth, patentee of No. 1,174,092, testified to the use of the expedient of T-wise splitting the skirt of a piston. He installed four pistons in a Ford truck in the spring of 1915 before writing to his patent attorneys on May 4, 1915. At that time he also made the drawing (Ex. 5-K-2) and the pistons were made and sold prior thereto. Before November, 1915, he replaced one of the original pistons sold with an oversize piston provided with a T-slot and without the adjusting device. Thereafter, he made pistons with a somewhat different adjusting mechanism, sold sets of pistons like Ex. 5-K-10 before March 26, 1917, which date is fixed by correspondence with his patent attorneys, the pistons operated until 1923.

Following Schoengarth's appearance as a witness an adjournment was had, and defendants' counsel stated that he would call Charles Garland, a mechanic who had worked with Schoengarth on the installation of his pistons in 1915, who was then too sick to appear to testify. Death overtook Garland before he testified, and Schoengarth testified that Garland had been interviewed by plaintiff's counsel during the recess. Any criticism of Schoengarth's testimony is hardly to be seriously considered since plaintiff's counsel have offered nothing to contradict his story, apparently given in good faith.

Schoengarth did not attempt to cover the T-slot expedient in his patent, so that feature became abandoned by him to the public. His testimony is clear that the T-slot expedient was in the set of pistons sold in the spring of 1915 and should constitute a bar to the claims of the Gulick patent directed to this feature. There is the further Schoengarth piston (Ex. 5-K-10) embodying arrangement of the T-slot with the head diameter extending down and overlapping the horizontal slot, which construction seems to constitute a reduction to practice and actual use of pistons. Further, as defendants urge, if the Schoengarth pistons are not sufficient to constitute a public use, his testimony and his patent application constitute intervening rights which should be an equitable estoppel as against this plaintiff.

Gulick and his counsel overlooked Schoengarth, or must have thought he would not show up for they diligently proceeded to antedate the Schoengarth patent by the affidavit under Rule 75 (Ex. 4-L, p. 1859), which, if not untruthful, at least misled the Patent Office. The presence of the adjusting mechanism in the Schoengarth pistons seems to be immaterial so far as this case is concerned for the T-slot, either with or without the adjusting mechanism, operates the same, that is, permits expansion and contraction of the skirt. If no one before had suggested a flexible piston it might be a different situation, but this had been suggested by Franquist in 1914, Rainforth in 1912 and Serex in 1911 and 1912, followed by Long, Spillman, Hives and even by Jardine and Maynard; and plaintiff accepted the ruling of the Patent Office that Ebbs did the same thing in 1902.

Plaintiff urges that there was only one witness produced to prove the use of the Schoengarth pistons. However, the fact that only one witness was produced does not alone justify a court in refusing to consider the subject of the testimony. In *Corona Cord Tire v. Dovan Corp.*, 276 U. S. 358 (1928), the Supreme Court accepted the uncorroborated testimony of a Dr. Kratz on the subject of a sale of 300 inner tubes, which was supported only by records of the order, and Mr. Chief Justice Taft said, p. 382:

> "It was not unnatural that with a small amount of D. P. G. he should try it in a special order of this kind from which he might confirm the conclusion he had already reached. The effort to disprove it was vague and inconclusive, which, it is only fair to say, was to be expected five years after the event."

The same can be said of Schoengarth for he had demonstrated the utility of the T-slot in the pistons of his patent, and it was, therefore, "not unnatural" that he should slit and install an overwise piston which did not require the adjusting means to keep it expanded. The testimony of one witness was also accepted as proof of the completion of an invention in *Armstrong v. De Forest Radio Telephone & Telegraph Co.*, 280 Fed. 584 (1922), where on p. 590 Judge Manton of the 2nd Circuit says:

> "There is no reason to doubt the testimony of the patentee as to the date of his inventive thought. While it is true that uncorroborated testimony of an inventor is to be accepted with caution (*Clark Thread Co. v. Willimantic Linen Co.*, 140 U. S. 481, 11 Sup. Ct. 846, 35 L. Ed. 521), yet there is no rule of law that requires the rejection of the uncorroborated testimony of an inventor as to the date of his conception. The court must be satisfied as to the fact of demonstration and that the conception was complete."

Long Pistons.

Defendants offered in evidence the Long pistons, and urge that these showed intervening rights, and examples of the expedients of the T-slot, but as against Jardine and Maynard, Long is offered for all purposes.

The Long pistons, patent Nos. 1,395,441, 1,489,499 and 1,572,772, are pleaded as a prior use (Def. Ex. 4-H), and exemplifications of the Long 6-slotted pistons are Defendants' Exs. E, F, G and R. Long submitted pistons to Franklin Manufacturing Company as early as March, 1916, as was also shown in interference proceedings, and on appeal in *Hertog v. Long*, 47 F. (2d) 369 (1931), the court says, at p. 370:

> "Louis M. Stellman, a witness whose testimony displays an intelligent grasp of the situation, and who was, at that time, chief engineer of the Franklin Manufacturing Company, testifies that in the early part of the year 1916 he talked with Long, and that Long displayed to him and others a piston of the type in question and which, according to his testimony, may be read plainly upon the second count of the interference."

As against the Gulick patent it is urged that the Long pistons constitute adverse rights to the expansion

of the Gulick application years after the Long pistons had gone into commercial use. These Long pistons illustrate the embodiment of the common T-slot expedient.

As against Jardine and Maynard it is urged that the Long pistons operate with full force and effect from the standpoint both of anticipation and lack of invention. It cannot be said that the Long pistons were impractical, for they were used in the air-cooled Franklin engine where pistons operate under the most adverse conditions.

The Long pistons, with the increase of engine speeds, went out of use in Franklin in 1926, plaintiff claims because the Long pistons scored at the junction of the webs with the skirt. This would have happened to Gulick, as well as to Jardine, neither of which patents was ever put into use, and the same thing happened to Maynard when it was attempted to use that patent structure. That the Long pistons went out of use seems to be immaterial.

Plaintiff urges that defendants' claim of intervening rights was disposed of by the case of *Roos v. McMillan*, 64 F. (2d) 568 (1933), "because Gulick disclosed and claimed broadly his piston from the beginning." Of course defendants' contention is that the Gulick claim was broadened in 1922 to cover something that he never had when filed, and if such view is adopted there is no pertinency in *Roos v. McMillan, supra*, as plaintiff contends.

INFRINGEMENT.

For the reasons previously given, the patents in suit are held invalid, which particularly applies to the claims alleged to be infringed by the Sterling and Ray Day pistons. The order of reference is general, and to comply therewith there must be consideration of the question of infringement. If any or all of the patents, or all or any of the claims alleged to be infringed should be held to be valid, they must be strictly construed as not to be infringed.

If the Gulick and Jardine patents differentiate from the prior art at all, it is by the employment of flexible webs extending from the wrist pin bosses to the skirt, which the Ray Day piston does not have, and the proof is here that the Sterling piston (Ex. 1) does not have such flexible webs as contemplated by the patents. The other Sterling pistons have no webs. The Gulick patent is thus restricted to a structure in which flexible webs extend from the wrist pin bosses to the skirt and are surrounded by the skirt, while the Jardine patent is re-

stricted to a slipper piston having flexible webs, and neither can comprehend a trunk piston with a dashed-in relief.

The Mooers patent is restricted to narrow connectors extending from the head flange to the bottom of the skirt, closely hugging the inside of the skirt so as to leave substantially 360 degrees separation. Sterling follows the Franquist patent and has from one-fourth to one-half isolation, that is through 90 to 180 degrees, with a connection between the head and the skirt in the region of the wrist pin bosses, made by heavy connectors as in Ex. 1, and extending for a quadrant. In Ray Day the connectors are from the head to the wrist pin bosses, requiring a sand core and are not from the head flange to the skirt permitting permanent molding.

The Schmiedeknecht patent is restricted to a construction in which each boss is supported at its end, with one end of the boss supported from the head, and the other end supported from the web. In the Sterling piston (Ex. 1) each boss is supported at its center, the opposite of what is described and claimed in the Schmiedeknecht patent.

The Maynard patent is not infringed unless the webs are flexible and so described in that patent, but that must be due to a construction contemplated by that patent, as plaintiff's expert said this was necessary as far as Gulick and Jardine patents are concerned. In the Sterling piston (Ex. 1) compensation is not secured at the top by web flexibility, but by the Keystone relief; and thus on plaintiff's claim Ex. 1 departs from the Maynard patent.

None of defendants' pistons have such identity or correspondence of structure, function and mode of operation as contemplated by the patents in suit, and particularly is this true as to those patents which are restricted by the prior art.

Heretofore has been considered the situation where a defendant has followed the prior art, citing decisions of this Circuit following the leading case of *McCormick v. Talcott*, 61 U. S. 402, where Judge Grier said, p. 405:

> "But if the invention claimed be itself but an improvement on a known machine by a mere change of form or combination of parts, the patentee cannot treat another as an infringer who has improved the original machine by use of a different form or combination performing the same functions. The inventor of the first improvement cannot invoke the doc-

trine of equivalents to suppress all other improvements which are not mere colorable invasions of the first."

To the same effect is *Electric Signal Co. v. Hall Signal Co.*, 144 U. S., 87 (1885), where Mr. Justice Matthews says, at p. 96:

"But this result or idea is not monopolized by the patent. The thing patented is the particular means devised by the inventor by which that result is attained, leaving it open to any other inventor to accomplish the same result by other means. To constitute identity of invention and therefore infringement, not only must the result attained be the same, but in case the means used for its attainment is a combination of known elements, the elements in both cases must be the same, and combined in the same way, so that each element shall perform the same function, provided, however, that the differences alleged are not merely colorable, according to the rule forbidding the use of known equivalents."

And again in *Westinghouse v. Boyden Brake Co.*, 170 U. S. 537 (1898), Mr. Justice Brown says, at p. 569:

"* * * the alleged infringer must have done something more than reach the same result. He must have reached it by substantially the same or similar means, or the rule that the function of a machine cannot be patented is of no practical value."

And after pointing out that "a charge of infringement is sometimes made out though the letter of the claims be avoided," he also says, p. 568:

"The converse is equally true. The patentee may bring the defendant within the letter of his claims, but if the latter has so far changed the principle of the device that the claims of the patent, literally construed, have ceased to represent his actual invention, he is as little subject to be adjudged an infringer as one who has violated the letter of a statute has to be convicted when he has done nothing in conflict with its spirit and intent."

The rule of *Railway v. Sayles Co.*, 97 U. S. 554 (1878), has been continuously followed in this Circuit, as follows, p. 556-7:

"But if the advance toward the thing desired is gradual, and proceeds step by step, so that no one

> can claim the complete whole, then each is entitled only to the specific form of device which he produces, and every other inventor is entitled to his own specific form, so long as it differs from those of his competitors, and does not include theirs."

The court, in *I. T. S. Rubber Co. v. Essex Co.*, 272 U. S. 427 (1926), decided that as to a claim which does not include on its face a limitation obviously intended, says, p. 442:

> "* * * we are of opinion that the claim should be construed and have the same effect as if it had been included. This is not in any real sense, a remaking of the claim, but is merely giving to it the meaning which was intended by the applicant and understood by the examiner."

And, at p. 444:

> "So where an applicant whose claim is rejected on reference to a prior patent, without objection or appeal, voluntarily restricts himself by an amendment of his claim to a specific structure, having thus narrowed his claim in order to obtain a patent, he 'may not by construction, or by resort to the doctrine of equivalents, give to the claim the larger scope which it might have had without the amendments which amount to a disclaimer.' *Weber Elec. Co. v. Freeman Elec. Co.*, 256 U. S. 668, 677."

In this Circuit the courts have had these questions before them on many occasions. In *Lektophone Corp. v. Crosley Radio Corp.*, 46 F. (2d) 126 (D. C. Ohio, 1928), Judge Hickenlooper, while District Judge, said, p. 130:

> "The defendant has done no more than to draw from the prior art, albeit including Hopkins, the various elements, themselves, all old, which accomplish to a material extent the desired results which it is claimed Hopkins accomplished, but by a combination of elements differing radically from the Hopkins combination in at least this one respect."
>
> "Hopkins nowhere taught the necessity of, or claimed as an element of his invention, means for restricting the edge of the cone against deformation. This was an incidental or accidental function of his annular rim, but there are many ways of accomplishing the same result. Hopkins chose one; the defendant another. So long as the defendant's

means of accomplishing the desired result is not merely the substitution of the mechanical equivalent for that of Hopkins, there can be no infringement."

In view of the fact that defendants' pistons approach the prior art as much if not closer than they do the pistons in suit, this case is quite in point, notwithstanding plaintiff's urge that the differences are only equivalent combinations. Such differences are shown by the means to secure compensation for expansion at the top of the skirt of the Sterling piston, and also in the Ray Day piston are different than the patents claim. Even in the Sterling piston (Ex. 1) which is said to have flexible webs but has none, the compensation at the top is secured by the Keystone relief which is unknown to Gulick, Jardine and even Maynard if the Maynard patent is a modified Jardine structure.

In *Fowler v. Detroit Bedding Co.*, 47 F. (2d) 752 (1931), in a *Per Curiam* decision, the court said, at p. 752:

"If the patent is valid (which we need not decide), the invention consists in so tapering and overlapping the ends of the bat that when it is folded about the core a bandage of uniform thickness results, or in the simplicity with which the bandage is manufactured, by merely tapering the ends of the bat before folding it."

Although the claim in that case was restricted to "tapered edges lapped on one side of the paper core," the contention was the defendant infringed because the claims could be read upon defendant's structure. The court, however, says, p. 752-3:

"Any slight tapering of the edges was not due to design, but was incidental to the manner in which the sheet or bat of the material came from the machine or to the effect of forcing it into the pleat of the cushion."

In *Directoplate Corp. v. Donaldson Lithographing Co.*, 51 F. (2d) 199 (1931), Judge Hickenlooper refers, as in other cases (p. 202) "to a specific construction of clearly defined elements all pertaining to the inventive step as he then understood it."

"Further than this, the defendant's device utilizes the forces of nature and operates in a manner substantially different from the device of the patent.

> The 'Bearing section' of the claim, as a separate unit unattached to negative or positioning frame, for so the claim must be construed in view of the specification, is wholly absent. So also are the practically unlimited play of the inner sealing strip upon the negative, the flange of the positioning section, and the function of the bearing section in horizontally bridging the gap between the negative and the positioning section. Elements of the claim are omitted, but more than this, the manner of operation of the two devices, we are convinced, is substantially different. If this be so the defendant's device does not infringe."

Again in *Goodyear Tire & Rubber Co. v. India Rubber Tire Co.*, 51 F. (2d) 204 (1931), in considering the status of the patent in view of the prior art, Judge Hickenlooper said, p. 206:

> "Here, the crowded condition of the patent art, the closely analogous uses by others (even if they be not regarded as anticipations), the nature of the disclosure, the very essence of the alleged inventive step, and the Patent Office proceedings, involving a possible estoppel, all limit the appellee to a breaker-strip of layers of parallel cords 'interposed between the tread and the cushion,' as provided in the claim and under principles more fully discussed in our opinion in *Directoplate Corp. v. Donaldson Lithographing Co.*, 51 F. (2d) 199, this day decided."

To the same effect is *Willett Mfg. Co. v. Root Spring Scraper Co.*, 55 F. (2d) 858 (C. C. A. 6, 1932); *Ottinger v. Ferro Stamping & Mfg. Co.*, 59 F. (2d) 640 (1932), decisions also by Judge Hickenlooper; and there is the very recent case of *Chicago Forging & Mfg. Co. v. Bode, Cummings Mfg. Co.*, 63 F. (2d) 928 (1933), where Judge Simons says, p. 930:

> "The defendant's device (see illustration), lacks the opposing inclined surface which we regard as necessary elements of the claim if it is to be considered as supported by the disclosure."
>
> "Obviously, and this was recognized by plaintiff's expert, the patentee was not entitled to claim all structures which exercised the desired function, but only those which he himself invented, and a device which produces the same result through translation of force operates in a substantially different manner than one in which force is directly applied."

Plaintiff urges that a different rule was followed by the Court of Appeals in *Byers Machine Co. v. Keystone Driller*, 44 Fed. 283 (C. A. 6, 1930), where the patents on a trench digging machine were held valid and infringed, but that case is clearly to be distinguished, for there the court said, p. 285, "that Clutter was a pioneer in this particular form or type of trench digging machine, and that claim 4 is entitled to a broad construction," which is quite different from the case presented at bar.

In *Remington Rand, Inc., v. General Fireproofing*, Equity No. 3441, before this court, it was said, p. 16:

> "These inventors entered an already crowded art, so that at the time the application was made for their patent, only improvements could be patented by them."

And further, at p. 22:

> "The rule is, that where the patent does not embody a primary invention but only an improvement to the prior art, and the defendant's machines can be differentiated, the charge of infringement is not sustained."

And again, in *Cleveland Tractor Co. v. International Harvester*, Equity No. 3860, it was held that claims must be construed not only in the light of the specification, but in light of the proceedings of the Patent Office, and it was said, at p. 23:

> "The rule of patent law is well established that the claims must be construed in the light of the specifications and drawings. Defendants cite *Computing Scale Co. of America v. Automatic Scale Co.*, 204 U. S. 609, in which there was read into a broad claim for 'mechanism' for doing a certain thing, the particular construction of such mechanism defined in the specification, in order to distinguish the invention from the prior art."

The listing of the Gulick patent as a pioneer patent, Jardine and Maynard as improvements which accomplish the useful purpose in a successful commercial form, and the Moores and Schmiedeknecht patents as patents which contribute to the utility and commercialization of that prior invention, is not justified on the record in this case. When it comes to infringement, the use of the Keystone relief in the Sterling piston (Ex. 1) compensates for expansion at the top where it is required, as distinguished

from making the webs flexible, and as to prior art, the mechanic had all the expedients at his command which he would naturally employ, and of this the Supreme Court says, in *Webster Loom Co. v. Higgins*, 105 U. S. 580 (1881), Mr. Justice Bradley saying, at p. 586:

> "He may begin at the point where his invention begins, and describe what he has made that is new, and what it replaces of the old. That which is common and well known is as if it were written out in the patent and delineated in the drawings."

RESORT TO "SYMPTOMS OF INVENTION" SO-CALLED, UNNECESSARY FOR SUCH NOT HERE CONTROLLING.

Plaintiff urges on behalf of the validity of these patents several arguments or claims which might be called "symptoms of invention." These are the long-felt want, prior efforts and failures, public adoption, public acquiescence and commercial success. The weight to be given such "symptoms of invention" in passing on patent validity is well settled. They are important and entitled to weight only when question of validity is doubtful.

Defendants answer that aluminum pistons were not needed until the recent developments of high speed automobile engines, and cite that even now one large manufacturer, General Motors Corporation, still uses iron piston; and there is also what Long showed in the making of aluminum pistons, with its beginnings in 1915-17.

COMMERCIAL ACCEPTANCE.

The situation here is peculiar, for the structures of none of the pistons in suit have ever gone into commercial use. That of Schmiedekneckt, Mocers, Gulick and Jardine not at all, while as to the Maynard design, the proof is that it was not used successfully until it had been provided with the Keystone relief. Particularly as to the Maynard piston it was discarded by Chrysler, an unwilling party plaintiff which has the right to its use as a half-owner of the patent.

Sales alone are not a test of patentability. In the early case of *McClain v. Ortmayer*, 141 U. S. 419 (1891), Mr. Justice Brown says, p. 428:

> "If the generality of sales were made the test of patentability, it would result that a person by securing a patent upon some trifling variation from

previously known methods might, by energy in pushing his goods drive competitors out of the market and secure a practical monopoly, without in fact having made the slightest contribution of value to the useful arts."

The plan of plaintiff and its licensees has been to control the market in the manufacture of aluminum pistons, and former competitors Bohn Aluminum & Brass and Kant-Skore became sub and collateral licensees. The statement is made that a settlement was made with Long, who had been a competitor, and although the terms do not appear in this case, such fact is admitted in plaintiff's reply brief, p. 160.

The language of Mr. Justice Stone in the recent Radio case of *De Forest v. General Electric*, 283 U. S. 664 (1931) is in point, where he says, p. 685:

"Only when invention is in doubt may advance made in the art be thrown in the scale to support it. If we were to assume that invention here was doubtful, we can find little to suggest that the high vacuum tube when produced satisfied a long felt want or that its present utility is indicative of anything more than the natural development of an art which has passed from infancy to its present maturity since Langmuir filed his application. There was little or no practical use for a high vacuum tube in 1913. The De Forest audion was not in general use and Langmuir did not see one until that year."

That was also a case where the application filed in 1913 issued some 12 years later in 1925, and it was held that no single element was broadly novel in the assemblage of elements making up the device defined in the issue.

The Court of Appeals of this Circuit had adopted the same view in *Jackson Shirt & Novelty Co. v. Rosenbaum*, 225 Fed. 331 (1915), and in *Weston Motor Carriage Co. v. Lindsay Auto Parts Co.*, 239 Fed. 821 (1917), where the specific design of the patent structure never was successful and did not become successful until redesigned with improvements added, and of this Judge Denison says, on the question of commercial success, p. 827:

"* * * but there is slight room to infer that its commercial acceptance was due to the merits of this particular patent rather than of the other patents and improvements which it embodied, and still

less to attribute its commercial success to the comparatively minor structural detail, viz. the peculiar sectional casing, without which it would not have responded at all to the two claims in suit. The commercial success of this Timken axle throws no light on the validity of this claim."

Also, the late Judge Westenhaver commented on the fact that "sales are due to the growth of industry and trade conditions and in no wise to the specific contribution," in *Troy Wagon Works v. Ohio Trailer*, 264 Fed. 347 (D. C. Ohio, 1920). In other Circuits there is *Haggerty v. Rawlings Mfg. Co.*, 14 F. (2d) 928 (C. C. A. 8, 1926), and in *Fleischman Yeast Co. v. Federal Yeast Co.*, 8 F. (2d) 186 (D. C. 1925), affirmed 13 F. (2d) 570 (C. C. A. 3, 1926), Judge Soper said, p. 199:

"Commercial success of a patented article is not persuasive evidence of invention as to a claim which covers only a part of the device or process, and, when it is shown that the claim in controversy does not cover the whole of the patented device or process, the weight of such evidence is very much reduced."

Such statement is pertinent here, for the patents formerly relied upon were the Spillman & Mooers and Franquist patents which expire in 1931 and 1932 respectively.

Acquiescence.

The various consent and default decrees on some of the patents in suit cannot help the plaintiff in this proceeding, nor is plaintiff helped by the fact that other suits are pending against Chrysler and Ray Day for the mere filing of a suit is only the assertion of the claim.

Until their expiration, plaintiff could rely upon the Spillman & Mooers and Franquist patents, and that piston manufacturers did not contest is no criterion of validity, for even the value and general use of a device will not sustain a patent if the lack of invention is clear. Of a situation not unlike that presented here, with the trustee owning many piston patents, Mr. Justice Holmes of the Supreme Court, in the recent *Mineral Separation v. Magma Copper*, 280 U. S. 400 (1930), says at p. 404:

"The petitioner adverts to the success that has attended the later patent and to the fact that the world waited until it appeared. But interlopers naturally would be slow to venture into the field occu-

pied by a powerful company armed with patent No. 835,120 and supported by a subtle ingenuity that we cannot doubt would have been exercised with even more effect to show that a process like that in No. 962,678 was an infringement than it now is to prove that the later patent was a revelation that transformed the art."

PRIOR ART NOT CITED IN THE ANSWER.

Over plaintiff's objection, there were offered in evidence several patents, publications and prior uses which were not cited in the answer. These included the patents to Howe, Leitzenmayer, Roots British, Serex French, Hartog and Pomeroy, articles by Ricardo in "The Automobile Engineer," by Gunn, Engineer of Packard, in "Automotive Industry," articles in "Automobile" of March 5th and March 12th, 1914, articles in "Horseless Age" of April 8, 1914 and December 24, 1913, the public and prior use by Monckmeier and Schoengarth, and sales by Schoengarth. As to Schoengarth, plaintiff later consented to an amendment to the answer.

Such patents, publications and prior uses constitute evidence of prior invention unless Gulick establishes an earlier date of invention, and the evidence offered seemed to be good references under R. S. 4920. The prior invention and not the patents which have been issued to such inventors constitute the defense as authorized in the second paragraph of the statute, and such defense is pleaded in the answer.

The rule is that notice need not be given prior to trial, of patents or other defenses to be introduced for the purpose of showing the prior art to demonstrate the lack of invention as distinguished from anticipation, *Grier v. Wall*, 120 U. S. 412 (1887); *Graham Paper Co. v. International Paper Co.*, 46 F. (2d) 881 (C. C. A. 8, 1931). The reason for such rule is pointed out by Judge Stone in *Zip Mfg. Co. v. Pasch*, 2 F. (2d) 828 (C. C. A. 8, 1924), where he says at p. 830:

> "The purpose of the statute is to prevent surprise in the evidence by giving the plaintiff thirty days notice of the particular patents and usage which will be relied upon in the challenge of the patent. Obviously, where the plaintiff must know of such instances, this notice serves no purpose. Such was the case of *Brown v. Piper*, cited above, where

prior usage was of such nature that the court took judicial notice thereof. It would seem to be an even clearer occasion for applying the same reasoning where the usage relied on is shown, in the language of the very patent in suit, to have been known to the plaintiff at that time. We think, therefore, that the trial court was right in considering, on the point of validity, the clear statement in this patent that grinding mixtures, employing oil as a 'binder,' were known to the art and that the improvement claimed was a change in the 'binder' from oil to starch."

The Pomeroy and Hartog patents in question are owned by the trustee plaintiff as shown in its *prima facie* case, and the Hartog patent was in Interference with Gulick. The Howe patent and the Hives British patent were cited by the Patent Office against the Maynard patent and the Schoengarth patent were also cited during the prosecution of the Gulick application and antidated Gulick. The Kant-Shore piston was known to plaintiff as it was manufactured by its licensee. None of these came as a surprise to plaintiff.

The particular pistons specified in the Bill of Complaint were the Sterling pistons Ex. 1 and the Ray Day piston Ex. 8. As the trial progressed, plaintiff's expert brought into the case five Sterling pistons and another Ray Day piston, asserting the five to be within the scope of Gulick, three within the scope of Jardine, three within the scope of Maynard and four within the scope of Moore. Following this came the offer of proof of the 1911 and 1914 Gulick pistons, and only late in the trial would plaintiff's counsel state its position as to whether the 1911 and 1914 pistons came within the scope of the Gulick patent. Having thus modified the issues, consideration of the Monckmeier piston seemed proper on the question of validity, and the same might be said to apply to the Serex French patents.

There is another view which justifies the consideration of the Monckmeier pistons and the Serex patent pistons on the question of validity, and that is from a standpoint of a well-known expedient of slotting the pistons through and through, and particularly by the T-slot. Such slotting was shown in the patents in Ebbs, Van Bever, Schoengarth, Vincent, Spillman, Long, Rainforth, Hives, Hartog, and now by Monckmeier and Serex, i.e. from Ebbs in 1902 to Hives in 1920. Thus the T-slot

was known over this period, and it seemed proper to receive evidence of additional instances of its notoriety without previous notice or in the answer; and this under the decisions of the court construing R. S. 4920, as was also done in *Cleveland Tractor v. International Harvester*, *supra*.

This practice is authorized by the rule as announced in *Elliott & Co. v. Youngstown Car Mfg. Co.*, 181 Fed. 345 (C. C. A. 3, 1910), by Judge Archbald, at p. 349:

> "The fact that so many persons caught the idea goes rather to prove that it was simple and obvious, and not that it required inventive genius to conceive. It is not like the case where the art is waiting for the device, and inventors striving unsuccessfully to produce it, under which circumstances invention may well be held to appear."

Cited with approval by Judge Killits of this District in *Phoenix Knitting Mill v. Rich*, 194 Fed. 721 (1911), *Freeney v. Bemis Bros. Bag Co.*, 1 F. (2d) 116 (C. C. A. 8, 1924); and Judge Westenhaver took the same view in *Open Hearth Furnace v. Youngstown Sheet & Tube Co.*, 2 F. (2d) 94 (1924), where there were a number of prior uses of the patent at different places.

The evidence of both the Monckmeier use and the Serax French patent can be here used to restrict the claims of all the patents in suit, particularly in view of plaintiff's insistence that the ordinary trunk piston provided with a relief and a T-slot, both known in the art, come within the scope of the patents in suit.

ALLEGED COPYING BY DEFENDANTS.

Plaintiff places much stress on the fact that the Sterling piston (Ex. 1) looks like that being sold by its licensees, although this can hardly be said of the other Sterling pistons and certainly not of the Ray Day pistons. As to this Sterling piston, the recent statement in *Buttendorf Co. v. Ohio Steel Foundry*, 56 F. (2d) 777 (C. C. A. 6, 1932), by Judge Hickenlooper, seems to be in point, at p. 779:

> "Clearly, if the claims as stated fail to disclose a patentable invention, no license is required, the device may be made and used by any one."

The mere copying of a device put on the market by plaintiff is not actionable unless a defendant palms off

its goods as those of plaintiff, and there is no evidence of that; also there is no allegation of unfair competition and plaintiff is not a manufacturer.

The defendants have not copied the structure of any of the patents in suit, not even that of Maynard, for a characteristic feature of Ex. 1 is the Keystone relief furnishing compensation at the top of the skirt, and compensation at the bottom being secured in the way long known to the art by splitting the piston skirt from the bottom up. Should plaintiff answer that the defendants are estopped to deny the utility of the Maynard piston without the Keystone relief and in spite of modification of Maynard as used, on this question of utility there is the statement in *Sandy MacGregor Co. v. Vaca Grip Co.*, 2 F. (2d) 655 (1924), where Judge Denison says, at p. 656:

> "Sufficient practical utility to make a device 'useful,' in the sense of the patent statute, is, we suppose, what is meant by the cases which say that an infringing defendant is estopped to deny utility. The phrase 'patentable utility' is sometimes perhaps rather inaccurately used to denote the function of being useful plus the skill of the inventor as distinguished from that of the mechanic. Of course, the infringer is not estopped to deny patentable utility in this sense, because if he were he could never dispute patentability."

And this view of the Court of Appeals was followed in *Seymour v. Ford Motor*, 44 F. (2d) 306 (C. C. A. 6, 1930).

Consideration has been given to all the issues, and there has been omitted from this report any discussion as to the efforts of plaintiff or The Aluminum Company of America to establish and control a monopoly in the manufacture of aluminum pistons. Defendants earnestly urge this to be a vicious monopoly, but that question is not here for discussion, and even if it were here, a disposition of such question has been made unnecessary by the findings of invalidity and non-infringement.

The Master reports that on the 30th day of December, 1933, he handed draft copies of this report to counsel and asked that errors and correction to be made be pointed out by counsel by January 15, 1934, that the Master might consider and make such corrections insofar as the Master believes proper and in keeping with the views as expressed in this report. Such suggestions have

been received and corrections made in the report. Two copies of this report have been furnished to counsel for each party.

Herewith I hand up for your Honors the following:

(1) Original files and papers from the Clerk of the Court in the three cases.

(2) Stipulations.

(3) Transcript of testimony, together with 134 Plaintiff's Exhibits and 91 Defendants' Exhibits.

(4) Briefs of counsel.

(5) Suggested findings of fact and conclusions of law submitted by counsel.

(6) Report of Special Master.

Respectfully submitted,

Wm. B. Woods,
Special Master.

January 27, 1934.

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PLAINTIFFS' EXCEPTIONS TO THE REPORT OF THE SPECIAL MASTER.

(Filed February 26, 1934.)

[Case No. 4045.]

Now come the plaintiffs and file this, their objections and exceptions to the findings, conclusions and report of the Hon. William B. Woods, Special Master, filed January 27, 1934, as follows*:

EXCEPTION NO. 1.

Plaintiffs object and except to the Master's Finding of Fact No. F1 (M. R. p. 1098) and to each of the following statements and conclusions thereof:

(a) "That the pistons of the Gulick patent embodies the fundamental structure of the Franquist patent No. 1,153,902"

as contrary to the evidence; see the testimony of Defendants' witnesses Stellman R. pp. 536, 553, 554 and 567, Dorris R. pp. 1078 and 1079, Jeffries, made defendants' witness on cross examination exceeding direct, over plaintiffs' objection, R. pp. 175 to 178, and plaintiffs' witness Jeffries R. pp. 201 to 203, 248, 942, 943 to 945 and 952; and see defendants' Exhibit 3-Q, piston made in accordance with the Franquist patent R. p. 178, and defendants' Exhibit 4-L, Gulick file wrapper, p. 1938 (citing Franquist patent); and as contrary to the evidence cited in support of Exception 3 hereof; and except and object to the statement:

(b) "and that the piston of the Franquist patent is operative to substantially compensate for expansion"

as contrary to the evidence; see evidence cited under "a", *supra*; and except and object to the statement and conclusion:

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*The following authorities have been relied upon for the form and manner of the exceptions taken herein:

Harding v. Handy et al., 11 Wheaton, 103, 6 L. Ed. 429;
Sheffield v. Gordon, 151 U. S. 285, 38 L. Ed. 164;
Sandford v. Embry, 151 Fed. 977, 982 (C. C. A. 8th);
Columbus etc. Ry. Appeals, 109 Fed. 180, 219 (C. C. A. 6th);
Savage v. Monarch, 64 Fed. 2d. 650, 651 (C. C. A. 10th);
Thomsen v. Stenabery, 55 Fed. 2d. 715, 716 (D. C. Ill.);
Perdyce v. Omaha, 145 Fed. 544, 557 (C. C. Mo.).

(c) "that the piston of the Gulick patent employs essentially the webs of the Spillman & Mooers patent No. 1,262,870 and of the Chenard & Walcker Patent No. 493,595"

as contrary to the evidence; see testimony of defendants' witness Stellman R. pp. 496 and 562, Jeffries, made defendants' witness on cross examination preceding the direct over plaintiffs' objections R. pp. 161 to 167, plaintiffs' witness Jeffries R. pp. 135 to 137, 943 to 949, and see plaintiffs' Exhibits 84; 67c p. 1539 and defendants' Exhibit 4L, Gulick file wrapper, pp. 1943, 1949, 1936 and 1938, (citing Spillman and Mooers and Chenard and Walcker); and as contrary to the evidence cited in support of item (a), *supra*, and plaintiffs' Exception No. 3 *post*; and except and object to the statement and conclusion:

(d) "that the web construction of the Gulick patent differentiates from those of Spillman & Mooers and Chenard & Walcker simply in matter of design involving mechanical skill"

as contrary to the evidence; see testimony of defendants' witness Stellman, Deposition R. p. 458, R. pp. 554, 555, 556 and 566, and contrary to the evidence cited in support of items (a) and (c) *supra*, and plaintiffs' Exception No. 3 *post*; and except and object to the statement and conclusion:

(e) "that splitting of the skirts of the Franquist, Spillman & Mooers and Chenard & Walcker patents by through slotting was within the purview of one skilled in the art."

as contrary to the evidence; see testimony of defendants' witnesses Stellman R. pp. 460 and 461, 538 to 541, 544, 545 to 547, 548, 554, 555, 562, 565, 567, 570 to 573, Dorris R. p. 1077, and also contrary to the evidence cited under items (a), (b), (c), and (d) *supra* and in Exception No. 3, *post*.

EXCEPTION NO. 2.

Plaintiffs further object and except to the failure of the Master to adopt items 1 and 2 of page 22 of plaintiffs' proposed Findings of Fact, summarized briefly as follows:

That the piston described and claimed in Gulick patent, No. 1,815,733, in suit was based upon a

new and original combination of elements that, coacting together, gave rise to a new mode of operation of the resulting piston structure, and the new combination of elements described in the Gulick patent and claimed in the claims in suit of the patent provided the first piston structure embodying these elements in combination and having the same mode of operation and accomplishing the results of the Gulick patented piston, and no prior art piston exhibited to the Court has the structure, mode of operation or accomplishes the results of the piston described and claimed in the Gulick patent in suit.

as shown by the evidence; see testimony of defendants' witness Stellman, R. pp. 554 and 566, and of plaintiffs' witness Jeffries R. pp. 188, 189, 195 to 202, 203, 204, 259 and 260, and as shown by the evidence cited in support of Exception No. 1, *supra*.

EXCEPTION NO. 3.

Plaintiffs further object and except to the failure of the Master to adopt items 1, 2, 3 and 4, pages 10 and 11, of plaintiffs' proposed Findings of Fact, briefly summarized as follows:

(a) That long prior to November 1920 the beneficial properties of aluminum and aluminum alloys as a material for pistons and piston structures was well understood in the art;

as shown by the evidence; see testimony of defendants' witness Stellman, Deposition pp. 458, 459, 460, 463, Dorris R. p. 1078, and plaintiffs' witness Dr. Jeffries R. pp. 90, 91, 98 to 109; and

(b) that there existed a long felt want for such inventions which was long unsupplied;

see testimony of defendants' witnesses Stellman, Deposition R. pp. 458, 460, 480, 538 to 541, 545 to 548, Venner, R. p. 347, and plaintiffs' witness Jeffries R. pp. 67, 92, 145, 185 to 187; and

(c) that there were many prior efforts and failures to accomplish what the patentees accomplished by men of outstanding ability and experience and skill in the art;

see testimony of defendants' witnesses Stellman, Deposition R. pp. 460, 461, 463, 464, 466, 467 and R. pp. 545 to 548 and 587 to 590, Dorris R. pp. 1074, 1075, 1078, 1079 and 1080, plaintiffs' witnesses Jeffries, R. pp. 185, 205 to 206 and 936, Murphy R. pp. 657 and 662, and Burns R. p. 675; and

(d) that the problem of providing a satisfactory piston in either iron or aluminum was a very complex problem;

see testimony of defendants' witnesses Stellman, Deposition R. pp. 459, 460, 463, 469 and R. pp. 588 to 590, Dorris R. pp. 1066 to 1076, 1077, 1078 and 1081, and plaintiffs' witness Jeffries R. p. 64; and

(e) that when the inventions of the patents in suit were made known to the public they were generally and extensively adopted by the public, who, generally speaking, have acquiesced in the patents in suit;

see testimony of defendants' witness Stellman, Deposition R. pp. 461 and 462, 470 and 471, Dorris R. pp. 1073 and 1074, plaintiffs' witness Jeffries R. pp. 78, 126, 132, 135, 136, 955, 1050 and 1051, and see the license agreements plaintiffs' Exhibits 38, 39 and 40, and the piston royalty reports plaintiffs' Exhibit 13; and

(f) that automobile engines were redesigned to take advantage of aluminum pistons;

see testimony of defendants' witness Stellman, Deposition R. p. 466; and

(g) that there has been persistent infringement in the face of litigation and Sterling Products Corporation duplicated pistons made by plaintiffs' licensees and made a substantial duplicate of pistons shown in the Maynard patent, after having made efforts to produce a satisfactory piston along other lines,

see plaintiffs' Exhibits 10A, 11, 12 and 19, and testimony of defendants' witnesses Stellman, Deposition R. pp. 461, 462, 470 and 471 and Dorris R. pp. 1073 to 1074 and 2168; and

(h) that the form of piston shown in the Maynard patent with slight and immaterial changes has been the standard form of piston ever since 1920.

See testimony of defendants' witness Stellman, Deposition R. pp. 461, 462 and 470, and plaintiffs' witness Jeffries R. pp. 80 to 86, 126, 132, 135, 136, 955, 1050 and 1051.

EXCEPTION NO. 4.

Plaintiffs object and except to the following statements and conclusions in the Master's Finding of Fact No. 12 (M. R. p. 1088)

> "That by admissions of plaintiffs' witness Gulick, Gulick abandoned and had in public use in this country during the year 1911, a piston exemplified by Exhibit 48, and during the year 1914, a piston exemplified by Exhibit 51;"

as contrary to the evidence; see testimony of plaintiffs' witness Gulick, R. pp. 731, 740, 741, 745 to 748, 754, 755, 756, 757, 758, 759, 761 and 805, and see defendants' Exhibit 4-L pp. 1842, 1859 to 1863, and 1952 to 1963 inclusive, and Interference decisions, plaintiffs' Exhibits 67C p. 1539, 69A p. 1550, 70A pp. 1566 and 1569, and 70B p. 1571.

EXCEPTION NO. 5.

Plaintiffs object and except to each statement and conclusion of the Master's Finding of Fact No. 14 (M. R. p. 1098)

> "That the Gulick specification while pending in the Patent Office was broadened beyond the original disclosure while pistons were produced, used and sold by the following parties:
>
> Elmer C. Long
> Gustave C. Monckmeier
> Walter L. Schoengarth
> Albert L. Spillman
> Kant-Skore Mfg. Co.
> Stephen B. Hartog
> Frank Jardine
> Aluminum Co. of America
> Howard E. Maynard
> Maxwell Motor Co.
> Ray Day
> William E. Vapner"

as contrary to the evidence; see testimony of defendants' witness Stellman R. pp. 567, 577, 578 and 579, Jeffries

made defendants' witness on cross examination exceeding the direct, over plaintiffs' objection, R. pp. 150, 155 and 156, and plaintiffs' witness Jeffries R. p. 201; and see defendants' Exhibit 4-L, Gulick file wrapper; and as contrary to the concurring findings of the Law Examiner (plaintiffs' Exhibits 68A and 69A), the Examiner of Interferences (plaintiffs' Exhibits 67B and 69A'), the Examiners-In-Chief (plaintiffs' Exhibit 68B), the Commissioner of Patents (defendants' Exhibit 4-F), the Board of Appeals (plaintiffs' Exhibits 67C, 69B and 69B"), the Court of Appeals of the District of Columbia 17 Fed. (2d) 686 (plaintiffs' Exhibit 68C), and the Court of Customs and Patent Appeals, 47 Fed. (2d) 365 (plaintiffs' Exhibit 67D) and 47 Fed. (2d) 367 (plaintiffs' Exhibit 69C).

EXCEPTION NO. 6.

Plaintiffs further object and except to the Master's Finding of Fact No. 14 (M. R. p. 1098), quoted in Exception No. 5, *supra*, and particularly to that portion thereof which states that certain pistons were produced, used and sold by various parties therein enumerated while the Gulick application was pending in the Patent Office (erroneously said by the Master to have been broadened beyond the original disclosure) as being irrelevant and immaterial.

EXCEPTION NO. 7.

Plaintiffs further object and except to the failure of the Master to adopt Item 10, pp. 12 and 13 of Plaintiffs' proposed Findings of Fact, briefly summarized as follows:

> That claim 1 of the Gulick patent in suit was in Gulick's application when it was originally filed, as original claim 3 (defendants' Exhibit 4-L, p. 1839) and remained in the Gulick application unchanged throughout the prosecution of the application in the Patent Office.

EXCEPTION NO. 8.

Plaintiffs further object and except to the failure of the Master to adopt Item 23, p. 21 of the plaintiffs' proposed Findings of Fact, as follows:

> Gustave Monckmeier, Walter L. Schoengarth, Albert L. Spillman, Stephen D. Hartog, Frank

Jardine, Howard E. Maynard and Ray Day individually produced, used and sold no pistons while the Gulick application was pending in the Patent Office. The Kant-Skore Manufacturing Company and Aluminum Company of America produced, used and sold their pistons under license from the Plaintiff The Cleveland Trust Company, which license included the Gulick application, plaintiffs' Exhibits 38 and 39. William E. Venner produced, used and sold not more than three or four sets of pistons, the castings for which were made by Aluminum Company of America (Venner deposition p. 352). The pistons produced, used and sold by Venner or Long after the Gulick application was filed, and the Ray Day piston shown in plaintiffs' Exhibits 35 and 8, and the Jardine (Aluminum Company of America) and Maynard (Maxwell Motor Company) pistons all came within Claim 1 of the Gulick patent (Claim 3 of the Gulick application as filed) which claim has been in the application ever since it was filed and these pistons likewise came within the subject-matter which was otherwise claimed all during the prosecution of the Gulick application (See claim 1 of Gulick patent and defendants' Exhibits E, F, R and G, and plaintiffs' Exhibits 1 and 8, and Jardine and Maynard patents). Maxwell Motor Company produced, used and sold pistons licensed through Aluminum Company of America, under the patents in suit during the prosecution of the application of the patent in suit. (R. pp. 78, 126, 132, 135, 136, 955, 1050 and 1051.)

EXCEPTION NO. 9.

Plaintiffs except and object to the Master's Finding of Fact No. 15 (M. R. p. 1098) and to each and every statement and conclusion thereof, as follows:

> "That after the filing of the Gulick application, his application was materially modified, both as to the specification and claims without warrant therefor in the original disclosure"

as contrary to the evidence; see complete file wrapper and contents of Gulick application, defendants' Exhibit 4-L, and see testimony of plaintiffs' witness Jeffries, R. pp. 173, 174 and 201, and the evidence cited in support of Exception No. 5, *supra*.

EXCEPTION NO. 10.

Plaintiffs object and except to the failure of the Master to adopt item 19, page 20 of plaintiffs' proposed Findings of Fact:

> That there was no enlargment of the disclosure of the Gulick specification or claims over the original disclosure

as shown by the evidence cited in support of plaintiffs' Exceptions Nos. 5, 7, 9 and 11:

EXCEPTION NO. 11.

Plaintiffs object and except to each statement and conclusion of the Master's Finding of Fact No. 16 (M. R. p. 1099)

> "That the Gulick patent does not describe in sufficient detail to enable one skilled in the art to reproduce the same, the length and thickness of the webs required to secure flexibility"

as contrary to the evidence; see testimony of defendants' witness Stellman R. pp. 567, 578 and 579, and plaintiffs' witness Jeffries, R. pp. 173, 174 and 201, and see the concurring findings of the Courts and Patent Office tribunals, plaintiffs' Exhibits 67, 68 and 69 (17 F. (2d) 686, 47 F. (2d) 365 and 47 F. (2d) 367), and as contrary to and irreconcilable with the Master's Findings of Fact Nos. 19 and 24 (M. R. p. 1099).

EXCEPTION NO. 12.

Plaintiffs further object and except to the failure of the Master to adopt item 22 of page 14 of plaintiffs' proposed Findings of Fact in substance briefly as follows:

> That the Gulick patent in suit is not indefinite and that the disclosure of the Gulick patent in suit is sufficient to teach those skilled in the art how to practice the inventions described and claimed therein

as shown by the evidence cited in support of plaintiffs' Exception No. 11, *supra*.

EXCEPTION NO. 13.

Plaintiffs object and except to the Master's Finding of Fact No. 17 (M. R. p. 1099) and to each and every part thereof, comprising each of the following statements and conclusions:

(a) "That the Jardine patent embodies the fundamental structure of Franquist patent No. 1,153,902,"

as contrary to the evidence; see the testimony of defendants' witnesses Stellman, R. pp. 554 and 566, Dorris R. p. 1079, and Jeffries, made defendants' witness on cross examination exceeding the direct over plaintiffs' objection, R. pp. 177 and 178, and plaintiffs' witness Jeffries R. pp. 202 to 204 and 207; and see defendants' Exhibit 3-Q, piston made in accordance with the Franquist patent R. p. 178, and the tests thereof exhibited to the Master R. pp. 207 and 208; and object and except to the statement and conclusion:

(b) "that it employs essentially the slipper piston structure of the Ricardo patent No. 1,294,833; and"

as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. 529, 554 and 566, and Plaintiffs' witness Jeffries R. pp. 74 to 76, 188, 189, 196, 259 and 260, and see defendants' Exhibit 4-L, p. 2052 (Jardine file wrapper citing Ricardo patent); and object and except to the statement and conclusion:

(c) "that the splitting of the slippers of the Ricardo patent was within the purview of one skilled in the art;"

as contrary to the evidence; see testimony of defendants' witnesses Stellman R. pp. 538 to 541, 545 to 547, 547, 554 and 566, Dorris R. pp. 1081 and 1082, and plaintiffs' witness Jeffries R. pp. 117, 142, 144, 145, 184 to 188, 205, 206, 219, 220, 226, 228, 256 to 257, 260 and 261, and the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 14.

Plaintiffs except and object to each and every statement and conclusion of the Master's Finding of Fact No. 18 (M. R. p. 1090)

"That the Jardine patent piston differs from the piston of the Long patent 1,872,772 in matters involving mere mechanical skill."

as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. 529, 562, 554 and 566; and contrary to the findings of the Patent Office in allowing

the claims of the Jardine patent after extensive interferences with various Long applications, including his application that matured into Patent 1,572,772 (defendants' Exhibit 4L, pp. 2068 to 2100) and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, *supra*, and plaintiffs' Exception No. 42, *post*.

EXCEPTION NO. 15.

Plaintiffs except and object to each and every statement and conclusion of the Master's Finding of Fact No. 19 (M. R. p. 1099)

> "That the Jardine piston differs from the piston of the Gulick patent in matters involving mere mechanical skill."

as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. 554 and 566, and plaintiffs' witness Dr. Jeffries R. pp. 74 to 76, and the findings of the Patent Office in allowing the claims of the Jardine patent after numerous and extensive interferences with the Gulick application (defendants' Exhibit 4L, pp. 2068 to 2087) and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 16.

Plaintiffs further object and except to the failure of the Master to adopt items 1 and 2 of page 24 of plaintiffs' proposed Findings of Fact, summarized briefly as follows:

> The piston described and claimed in Jardine Patent No. 1,763,523 was based upon a new and original combination of elements that, coacting together, gave rise to a new mode of operation of the resulting piston structure and the new combination of elements described in the Jardine patent in suit and claimed in the claims in suit of the patent provided the first piston structure embodying these elements in combination and having the mode of operation and accomplished the results of the Jardine patented piston, and no prior art structure exhibited by defendants has the structure, mode of operation, or accomplishes the results of the piston described and claimed in the Jardine patent in suit.

as shown by the evidence; see testimony of defendants' witness Stellman R. p. 554, and the evidence cited in support of Exceptions Nos. 13, 14 and 15, *supra*.

EXCEPTION NO. 17.

Plaintiffs except and object to each and every statement and conclusion of the Master's Finding of Fact No. 20 (M. R. p. 1099)

> "That the Jardine patent does not describe in sufficient detail to enable one skilled in the art to reproduce the same, the length and thickness of the webs required to secure flexibility."

as contrary to the evidence; see the testimony of defendants' witness Stellman, Deposition R. pp. 461, 462 and 470, and R. p. 539, and plaintiffs' witness Jeffries R. pp. 122, 170, and see the Jardine patent in suit (plaintiffs' Exhibit 3); and as contrary to and irreconcilable with the Master's Finding of Fact No. 22 (M. R. p. 1099).

EXCEPTION NO. 18.

Plaintiffs further except to the failure of the Master to adopt item 22, page 14 of plaintiffs' proposed Findings of Fact, in substance briefly as follows:

> That the Jardine patent in suit is not indefinite and that the disclosure of the Jardine patent in suit is sufficient to teach those skilled in the art how to practice the invention described and claimed therein.

as shown by the evidence cited in support of plaintiffs' Exception No. 17.

EXCEPTION NO. 19.

Plaintiffs except and object to the Master's Finding of Fact No. 21 (M. R. p. 1099) and to each and every part of each of the following statements made therein:

> "The Maynard patent embodies the fundamental structure of the Franquist patent No. 1,153,902, and that the splitting of the skirt by through and through slotting was within the purview of one skilled in the art."

as not pleaded against this patent in defendants' answer; and as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. 528, 554 and 566; and

plaintiffs' witness Jeffries R. p. 204, and the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 20.

Plaintiffs except and object to each and every statement of the Master's Finding of Fact No. 22

> "That the Maynard patent piston differs from the piston of the Jardine patent 1,763,523 in matters involving mere mechanical skill."

as contrary to the evidence; see testimony of defendants' witness Stellman, R. pp. 554 and 566, and plaintiffs' witness Jeffries, R. pp. 76 and 77; and see defendants' Exhibit 4L (file wrapper of Maynard showing extensive interferences with Jardine) and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 21.

Plaintiffs except and object to each and every statement and conclusion of the Master's Finding of Fact No. 23

> "That the Maynard patent piston differs from the piston of the Long patent 1,395,441 in matters involving mere mechanical skill."

as contrary to the evidence; see testimony of defendants' witness Stellman R. pp. 554 and 566, and the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 22.

Plaintiffs except and object to each and every statement of the Master's Finding of Fact No. 24 (M. R. p. 1099)

> "That the Maynard patent piston differs from the piston of the Gulick patent in matters involving mere mechanical skill."

as contrary to the evidence; see testimony of defendants' witness Stellman, R. pp. 554 and 566, and plaintiffs' witness Jeffries R. pp. 81 and 82, and see defendants' Exhibit 4L, pp. 1871 to 1893, (Maynard file wrapper showing extensive interferences with Gulick); and contrary to the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 23.

Plaintiffs except and object to each and every statement of the Master's Finding of Fact No. 25 (M. R. p. 1099)

> "That the Maynard patent piston differs from the piston of the Schmiedeknecht patent in matters involving mere mechanical skill."

as contrary to the evidence; see testimony of defendants' witness Stellman R. pp. 554 and 566 and see defendants' Exhibit 4L$_{11}$, p. 2219 (Maynard file wrapper showing consideration of Schmiedeknecht patent); and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 24.

Plaintiffs except and object to each and every statement of the Master's Finding of Fact No. 26 (M. R. p. 1099)

> "That the Maynard patent piston differs from the piston of the Ricardo patent 1,294,883 in matters involving mere mechanical skill."

as contrary to the evidence; see testimony of defendants' witness Stellman R. pp. 554, 555, 566 and 574, and plaintiffs' witness Jeffries R. p. 188, and see defendants' Exhibit 4L$_{4}$, p. 2155 (Maynard file wrapper showing consideration of Ricardo patent); and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 25.

Plaintiffs except and object to each and every statement of the Master's Finding of Fact No. 27 (M. R. p. 1099)

> "That the Maynard patent piston differs from the piston of the Hives patent No. 140,996 in matters involving mere mechanical skill."

as not pleaded in defendants' answer, and as contrary to the evidence; see the testimony of defendants' witness Stellman, R. p. 554, plaintiffs' witness Jeffries, R. p. 940, and see defendants' Exhibit 4L$_{11}$, page 2168, (Maynard file wrapper showing consideration of Hives patent); and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 26.

Plaintiffs further except and object to the failure of the Master to adopt items 1 and 2, page 25 of plaintiffs' proposed Findings of Fact, summarized briefly as follows:

> The piston described and claimed in Maynard patent, No. 1,053,962, in suit was based upon a new and original combination of elements that, coacting together, gave rise to a new mode of operation of the resulting piston structure and the new combination of elements described in the Maynard patent and claimed in the claims in suit of the patent provided the first piston structure embodying these elements in combinations, and having the mode of operation and accomplishing the results of the Maynard patented piston, and no prior art piston exhibited to the Court has the structure, mode of operation, or accomplished the results of the piston described and claimed in the Maynard patent in suit.

as shown by the evidence; see evidence relied upon in support of plaintiffs' Exceptions Nos. 19, 20, 21, 22, 23, 24 and 25.

EXCEPTION NO. 27.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 28 (M. R. p. 1060)

> "That the Moqers patent embodies the fundamental structure of the Franquist patent No. 1,153,902 and that the employment of narrow connectors was within the purview of one skilled in the art."

as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. 554 and 574, and Jeffries, made defendants' witness by cross examination exceeding direct over plaintiffs' objection, R. pp. 168 and 175 to 178, and plaintiffs' witness Jeffries, R. pp. 202, 204 and 205; and see defendants' Exhibit 4L, p. 1988 (file history of Moqers showing consideration of Franquist patent) and as contrary to the evidence cited in support of Exception No. 3, *supra*.

EXCEPTION NO. 28.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 29 (M. R. p. 1100)

> "That the Moocrs patent piston differs from the piston of the Spillman & Moocrs patent No. 1,092,870 in suit in matters involving mere mechanical skill."

as contrary to the evidence; see the testimony of defendants' witness Stellman, R. pp. 554, 560 and 561, and Jeffries, made defendants' witness on cross examination exceeding direct over plaintiffs' objection, R. pp. 108 to 109, and plaintiffs' witness Jeffries R. pp. 197, 198 and 204; and see face of Moocrs patent citing Spillman & Moocrs; and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 29.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 30 (M. R. p. 1100)

> "That the Moocrs patent piston differs from the piston of the Chenard & Walcker patent No. 468,595 in matters involving mere mechanical skill."

as contrary to the evidence; see testimony of defendants' witness Stellman, R. pp. 554, 560, 561 and 562, and plaintiffs' witness Jeffries R. pp. 947 and 948; and see defendants' Exhibit 4L,, page 1988, (Moocrs file wrapper showing consideration of Chenard & Walcker patent); and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 30.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 31 (M. R. p. 1100)

> "That the Moocrs patent piston differs from the piston of the Gulick 1911 and 1914 pistons (Exhibits 48 and 51) in matters involving mere mechanical skill."

as contrary to the evidence; see the testimony of defendants' witness Stellman, R. p. 554; and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 31.

Plaintiffs further object and except to the failure of the Master to adopt items 1 and 2 of page 27 of plaintiffs' proposed Findings of Fact, summarized briefly as follows:

> That the piston described and claimed in Mooers patent No. 1,402,309 was based upon a new and original combination of elements that, coacting together, gave rise to a new mode of operation of the resulting piston structure and the new combination of elements described in the Mooers patent in suit and claimed in the claims in suit of his patent provided the first piston structure embodying these elements in combination having the mode of operation and accomplishing the results of the Mooers patented piston, and no prior art structure exhibited by defendants had the structure, mode of operation or accomplished the results of the piston described and claimed in the Mooers patent in suit.

as shown by the evidence cited in support of plaintiffs' Exceptions Nos. 27, 28, 29 and 30, *supra*.

EXCEPTION NO. 32.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 32 (M. R. p. 1100)

> "That after the filing of the Mooers application, his application was materially modified both as to specification and claims without warrant therefore in the original disclosure."

as contrary to the evidence; see testimony of defendants' witness Stellman R. p. 517, and plaintiffs' witness Jeffries R. pp. 78 to 79.

EXCEPTION NO. 33.

Plaintiffs further object and except to the failure of the Master to find:

> That there was no enlargement of the disclosure of the Mooers specification or claims over the original disclosure.

as shown by defendants' Exhibit $4L_1$ (file wrapper of the Mooers patent), offered R. p. 591, and the affidavits appearing therein on pages 16, 37 and 38.

EXCEPTION NO. 34.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 33 (M. R. p. 1100) comprising the statement and conclusion

(a) "That the Schmiedeknecht patent involves the fundamental structure of the Franquist patent No. 1,153,909 or of any trunk piston;"

as not pleaded against this patent in defendants' answer; as contrary to the evidence; see the testimony of defendants' witness Stellman, R. pp. 554, 552, 553 and 522; and plaintiffs' witness Jeffries, R. pp. 114 and 205; and as irreconcilable and inconsistent with the Master's holding (M. R. p. 1119); and excepts to the statement and conclusion:

(b) "that it employs essentially the construction and arrangement of webs and mounting of wrist pin bosses of the Pugh British patent 17,256 of 1907 and the arrangement of the webs of the Ferry British patent 12,772 of 1914; and that the construction of the Schmiedeknecht patent differs from those of Pugh and Ferry patents and from a trunk piston in matters of design involving mere mechanical skill."

as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. 513, 515, and 516, and plaintiffs' witness Jeffries R. pp. 114 to 115, 950 and 951, and see defendants' Exhibit 4L., (the Schmiedeknecht file wrapper showing consideration of the Pugh and Ferry patents); and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, *supra*.

EXCEPTION NO. 35.

Plaintiffs further object and except to the failure of the Master to adopt items 1 and 2 of page 26 of plaintiffs' proposed Findings of Fact;

That the piston described and claimed in Schmiedeknecht patent No. 1,256,265 was based upon a new and original combination of elements that, coacting together, gave rise to a new mode of operation of the resulting piston structure, and the new combination of elements described in the Schmiedeknecht patent in suit and claimed in the claims in suit of the Schmiedeknecht pat-

ent provided the first piston structure embodying those elements in combination and having the mode of operation and accomplishing the results of the Schmiedeknecht patented piston, and no prior art piston structure exhibited by defendants has the structure, mode of operation or accomplished the results of the piston described and claimed in the Schmiedeknecht patent in suit.

as shown by the evidence cited in support of plaintiffs' Exception No. 34, *supra*.

EXCEPTION NO. 36

Plaintiffs object and except to the Master's Finding of Fact No. 34 (M. R. p. 1100) in the Master's use of the word "admission" in line 1 thereof as erroneously characterizing the whole direct Gulick testimony, R. pp. 699 to 730; and object and except to the statement and conclusion:

(a) "that such piston like Ex. 51 was not given a block test for the reason given by Gulick that he was satisfied with the previous tests * * *;"

as contrary to evidence of plaintiffs' witness Gulick R. p. 734; and object and except to the statement and conclusion:

(b) "that no effort was made to place the embodiments of the 1911 and 1914 pistons in the application of the Gulick patent;"

as contrary to the evidence cited in support of plaintiffs' Exception No. 7, *supra*, and as contrary to and irreconcilable with that part of the Master's Finding of Fact No. 12 (M. R. p. 1098) stating:

(c) "that by admission of plaintiffs' counsel, both pistons (the 1911 and 1914 pistons) embody the subject matter of claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 42 and 43 and Ex. 51 (the 1914 piston) additionally of claim 38." (Parenthetical inserts ours)

EXCEPTION NO. 37.

Plaintiffs object and except to the failure of the Master to find from the evidence:

(a) That the piston is the heart and vital spot of the motor and it is essential that pistons be rugged and durable;

see testimony of defendants' witnesses Stellman, R. pp. 588 to 590, Dorris R. p. 1077, plaintiffs' witness Jeffries R. pp. 61, 62, 915, 936 and 962; and object and except to his failure to find:

(b) That only many thousands of miles of testing over much time can prove durability of pistons;

see defendants' deposition Exhibits D and H, and plaintiffs' Exhibit 42c, and the testimony of defendants' witness Stellman, Deposition R. pp. 451 to 457, and plaintiffs' witnesses Gulick R. pp. 802 to 810, Burns R. p. 677, Jeffries R. pp. 915, 959, 960 and 963; and object and except to his failure to find:

(c) That in 1911 and 1914 pistons were block tested and road tested in automobiles operated by engineers in the ordinary course of their business and pleasure, for many thousands of miles and over long periods of time;

see testimony of defendants' witness Stellman, Deposition R. pp. 451 to 457, and R. p. 473, Dorris R. pp. 1075 to 1076, 1082, 1083, and 1086 to 1089, and see defendants' deposition Exhibits D and H, and plaintiffs' Exhibit 42c, and the testimony of plaintiffs' witnesses Murphy R. pp. 653 and 654, Burns R. pp. 674, 676, 677, 691, to 692, Gulick R. pp. 803 to 810 and 822 to 823, and Jeffries R. pp. 914, 916 and 976, and object and except to his failure to find:

(d) That external observation of the motor, listening to the motor, observing behavior of the motor under different conditions was the common method of testing pistons in 1911 and 1914;

see testimony of Burns R. pp. 686, 691 and 692, Gulick R. pp. 809 and 810, and see Franklin Company Experimental Records, defendants' Exhibits D and H, and plaintiffs' Exhibit 42c; and object and except to his failure to find:

(e) That experimentation concludes only when pistons go into production;

see testimony of defendants' witness Dorris R. p. 1076.

EXCEPTION NO. 38.

Plaintiffs object and except to the Master's Finding of Fact No. 35 (M. R. p. 1102) and to each and every statement and conclusion thereof, comprising each of the following statements:

(a) "That the Monckmeier pistons, Exs. 3-V and 3-W, were in use by Gustave C. Monckmeier in this country in his automobile for more than two years prior to the Gulick application for patent; that such pistons embodied a T-slot disposed intermediate the wrist pin bosses with the horizontal of the T below the bottom ring land and with the vertical of the T intermediate the bosses;"

as not pleaded in defendants' answer, as immaterial and irrelevant; and as not proved beyond a reasonable doubt; see testimony of plaintiffs' witnesses, Sweet R. pp. 833, 834 and 835, Henderson R. pp. 847, 848 and 849, and Jeffries R. pp. 923 and 924, and defendants' witness D'Vorsky R. p. 332; and plaintiffs object and except to the statement and conclusion:

(b) "that such T-slotting functioned to compensate for expansion; that any reduction in head diameter to the horizontal slot involved mere mechanical skill;"

as contrary to the evidence; see testimony of defendants' witnesses Monckmeier R. pp. 305, 306 and 311, D'Vorsky R. pp. 336 and 343, and Stellman R. pp. 481, 556, 557 and 558; and see defendants' Exhibit 4-P; and the testimony of plaintiffs' witness Jeffries R. pp. 922, 923 and 924; and plaintiffs object and except to the statement and conclusion:

(c) "that such use of the Monckmeier pistons more than two years prior to the application of the Gulick patent in suit was open and not in secret but known to others and in fact public;"

as not proved beyond a reasonable doubt; see testimony of defendants' witness Monckmeier R. pp. 300, 303 and 319; and plaintiffs object and except to the statement:

(d) "that the testimony of Monckmeier and his corroborating witnesses is reasonably satisfactory and reliable."

as contrary to the evidence; see the testimony of plaintiffs' witnesses, Jeffries R. pp. 921 to 924, Sweet R. pp. 834, 835, 847 and 848 (as to splits in the Monckmeier pistons) and R. pp. 833 and 834 (as to the date of change from iron to aluminum) and Henderson R. pp. 848 and 849 (as to splits in the Monckmeier pistons) and R. pp.

848 and 849 (as to date of change from iron to aluminum pistons) and Jeffries R. pp. 921 to 924; and see the sketch defendants' Exhibit 4-Q (made by D'Voraky when he saw only the aluminum pistons defendants' Exhibit 3-W, R. p. 334).

EXCEPTION NO. 39.

Plaintiffs object and except to the failure of the Master to adopt items 1 to 8 inclusive, of pages 29 to 31 inclusive, of plaintiffs' Proposed Findings of Fact, summarized briefly as follows:

> That the evidence does not establish beyond a reasonable doubt that Monckmeier had a split skirt piston like defendants' Exhibits 3-V and 3-W, or had such pistons in public use more than two years prior to Gulick's filing date; and that such pistons as Monckmeier may have made, which he claims were split, were only experimental and were abandoned; and that there is no contemporaneous documentary evidence showing that Monckmeier ever had a split skirt piston or publicly used any split skirt piston;

see evidence cited in support of plaintiffs' Exception No. 38, *supra*.

EXCEPTION NO. 40.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 36 (M. R. p. 1102)

> "That for more than two years prior to the application of the patent in suit, Walter L. Schoengarth made and sold at Ironwood, Michigan, pistons of the construction shown and described in the Schoengarth patent 1,174,902 but omitting the adjusting device; that such pistons functioned to compensate for expansion; that any reduction of head diameter to circumferential slot was a matter within the purview of a skilled mechanic; and that the Schoengarth pistons were publicly used and sold in this country more than two years prior to Gulick's application for patent. That for more than two years prior to the application of the patent in suit, Walter L. Schoengarth made and sold at Ironwood, Michigan, pistons of the construction shown and de-

scribed in the Schoengarth patent 1,174,092. That the testimony of Schoengarth is reasonably corroborated, satisfactory and reliable. That the omission of the adjusting devices is within the purview of any skilled mechanic."

as immaterial and irrelevant, as not proved beyond a reasonable doubt, and as contrary to the evidence; see the testimony of defendants' witnesses Schoengarth R. pp. 900, 908 and 910, Stellman, R. p. 560, and plaintiffs' witness Dr. Jeffries, R. pp. 915 to 917, 1063 and 1054.

EXCEPTION NO. 41.

Plaintiffs object and except to the failure of the Master to adopt all of plaintiffs' Proposed Findings of Fact, pages 32 and 33, briefly summarized as follows:

That this piston described in the Schoengarth patent does not have the structure, mode of operation, or results of any patent in suit and only operates like and only accomplishes the results of a conventional trunk type piston; that the piston described in the Schoengarth patent, with the adjusting device omitted, does not have the structure, mode of operation or accomplish the results of any patent in suit;

as shown by the evidence; see the testimony of defendants' witness Dorris R. p. 1078 and plaintiffs' witness Jeffries R. pp. 915 to 917, and

that Schoengarth did not prove either public use or sale of any piston like that shown in his patent more than two years before the filing date of any patent in suit;

as shown by the evidence; see the testimony of defendants' witness Schoengarth R. pp. 900, 908 and 909.

EXCEPTION NO. 42.

Plaintiffs object and except to the following statements and conclusions in the Master's Finding of Fact No. 37 (M. R. pp. 1162 and 1163)

"That one Elmer C. Long, in March, 1916 exhibited to Louis Stellman and William Venner at Syracuse, New York, a six slotted piston of the construction shown by Exs. Y and A re-

spectively. That six slotted pistons of the construction shown in Exhibit A and also in Exhibit F were sold by Long to Venner while Venner was at South Bend, Indiana, as early as 1917, and that during the year, 1917, Venner sold such pistons as replacements in Franklin automobiles; and that Venner continued to sell such pistons furnished him by Long and of the construction shown in Exs. E, F and G from 1918 to 1926. That a piston of the construction shown in the Long patent 1,395,441 with a T-slot was tested at Franklin Automobile Co., at Syracuse, New York, July, 1918 as admitted by plaintiff's witness, Burns. That during the year 1918, Elmer C. Long manufactured and sold six-slotted pistons of the construction shown in Exs. E, F, G and R for replacement in automobiles and that such pistons were actually used during the year, 1918 in automobiles; * * *" and

* * * * *

"That the Long pistons of 1917-1926 were successful pistons and from 1917 to 1922 were the only commercial pistons which automatically compensated for expansion."

as immaterial, as not proved beyond a reasonable doubt, as unsupported by any contemporaneous documentary evidence; and as contrary to the evidence; see testimony of defendant's witness Stellman, Deposition R. pp. 458, 459, 456, 562, 570, and Venner Deposition R. pp. 360, 361; and plaintiff's witness Murphy, R. p. 653; also see plaintiff's Exhibits Nos. 42, 43, 44 and 45; and see interference decisions plaintiff's Exhibits 67-B, pp. 1536 and 1537, 67-C, p. 1539, 69-A, p. 1550, 70-A, pp. 1566 and 1569, 70-B, p. 1571.

EXCEPTION NO. 43.

Plaintiffs object and except to the Master's failure to adopt items 1 to 3, inclusive, of page 35 of plaintiff's proposed Findings of Fact, summarized briefly as follows:—

That the evidence does not establish beyond a reasonable doubt that Long ever had any pistons like Exhibits E, F, G, R or 3-F or like the

pistons shown in his patents 1,395,441 or 1,872,772, prior to Gulick's filing date or prior to Gulick's invention or prior to Schmiedeknecht or Mooers; that priority as between Gulick and Long on issues the same as made up here was decided by all the tribunals of the Patent Office and of the courts reviewing those decisions in favor of Gulick; and that the great majority of the commercially used Long pistons were made under license under the applications from which the patents in suit eventuated.

as shown by the evidence cited in support of plaintiff's Exceptions Nos. 2, item (e) and 42.

EXCEPTION NO. 44.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 38 (M. R. p. 1104)

"That defendants' pistons, Ex. 1, BBB, CCC, 3-J, 3-O and 8 do not embody the structure, function and mode of operation of the Gulick patent in suit."

as contrary to the evidence; see testimony of defendants' witnesses Stellman, R. pp. 526, 527, 530, 536, 566, 567, 568, 579 and 580, Dorris, R. pp. 1070 to 1072, and Dr. Jeffries, made defendants' witness on cross examination exceeding the direct over plaintiffs' objection, R. pp. 124 and 174 as to Exhibit BBB, and plaintiffs' witness Jeffries R. pp. 82, 83, 84 and 158 to 160 as to Exhibit 1, R. pp. 124 and 190 as to Exhibit BBB, R. pp. 199 and 200 as to Exhibit CCC, R. p. 955 as to Exhibit 3-J, R. p. 956 as to Exhibit 3-O, and R. pp. 85 and 161 as to Exhibit 8.

EXCEPTION NO. 45.

Plaintiffs object and except to the failure of the Master to adopt items 3 to 8, inclusive, pages 22 and 23 of plaintiffs' Proposed Findings of Fact, summarized briefly as follows:

That each of defendants' pistons, defendants' Exhibits 1, BBB, CCC, 3-J, 3-O and 8 embody the invention claimed in each of the claims of the Gulick patent upon which plaintiffs rely and

each of said defendants' pistons have the same or substantially the same structure, function and mode of operation and accomplish the same or substantially the same results as the Gulick patented piston as defined by said claims;

as shown by the evidence cited in support of plaintiffs' Exception No. 44.

EXCEPTION NO. 46.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 39 (M. R. p. 1104)

"That defendants' pistons, Exhibits 1, BBB, CCC and 8 do not embody the structure, function and mode of operation of the Jardine patent in suit."

as contrary to the evidence; see the testimony of defendants' witness Stellman, R. pp. 566, 530, 552, 553, 579, 580, 581, 567 and 568, and Jeffries, made defendants' witness on cross examination exceeding the direct over plaintiffs' objection R. pp. 123, 124 and 173 to 175 as to Exhibit BBB, and plaintiffs' witness Jeffries, R. pp. 81 to 84 as to Exhibit 1, R. pp. 190 and 199 as to Exhibit BBB, R. p. 198 as to Exhibit CCC, and R. pp. 84 to 86 as to Exhibit 8.

EXCEPTION NO. 47.

Plaintiffs object and except to the failure of the Master to adopt items 3 to 6 inclusive, page 24 of plaintiffs' proposed Findings of Fact, summarized briefly as follows:

That each of defendants' pistons, defendants' Exhibits 1, BBB, CCC, and 8 embody the invention claimed in each of the claims of the Jardine patent upon which plaintiffs rely and each of said defendants' pistons have the same or substantially the same structure, function and mode of operation and accomplish the same or substantially the same results as the Jardine patented piston as defined by said claims.

as shown by the evidence cited in support of plaintiffs' Exception No. 46.

EXCEPTION NO. 48.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 40 (M. R. p. 1104)

> "That defendants' pistons, Exs. 1, BBB, CCC do not embody the structure, function and mode of operation of the Maynard patent in suit."

as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. [illegible], and Dr. Jeffries, made defendants' witness on cross examination, exceeding the direct over plaintiffs' objection, R. pp. 124 and 174 as to Exhibit BBB, and plaintiffs' witness Jeffries, R. pp. 80 to 82, 84 and 122 to 124 as to Exhibit 1, R. p. 190 as to Exhibit BBB, and R. p. 200 as to Exhibit CCC.

EXCEPTION NO. 49.

Plaintiffs object and except to the failure of the Master to adopt items 3 to 6 inclusive, page 25, of plaintiffs' Proposed Findings of Fact, summarized briefly as follows:

> That each of defendants' pistons, defendants' Exhibits 1, BBB, CCC embody the invention claimed in each of the claims of the Maynard patent upon which plaintiffs rely and each of said defendants' pistons have the same or substantially the same structure, function and mode of operation and accomplish the same or substantially the same results as the Maynard patented piston as defined by said claims.

as shown by the evidence cited in support of plaintiffs' Exception No. 48.

EXCEPTION NO. 50.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 41 (M. R. p. 1104)

> "That defendants' pistons, Exs. 1, BBB, CCC, 3-C, 8 and 9 do not embody the structure, function and mode of operation of the Mocers patent in suit."

as contrary to the evidence; see testimony of defendants' witnesses Stellman R. pp. 517, 518, 525 and 526,

Dorris R. pp. 1071 and 1072, and Jeffries, made defendants' witness on cross examination exceeding the direct over plaintiffs' objection, R. pp. 109 and 110 as to Exhibit BBB, and plaintiffs' witness Jeffries R. pp. 83, 84, 111 and 128 as to Exhibit 1, R. pp. 199 and 234 as to Exhibit BBB, R. pp. 199, 200 and 234 as to Exhibit CCC, R. pp. 966 and 967 as to Exhibit 3-O, and R. pp. 85, 86 and 112 and 113 as to Exhibits 8 and 9.

EXCEPTION NO. 51.

Plaintiffs object and except to the failure of the Master to adopt items 3 to 8 inclusive, pages 27 and 28 of plaintiffs' proposed Findings of Fact, summarized briefly as follows:

> That each of defendants' pistons, Exhibits 1, BBB, CCC, 3-O, 8 and 9 embody the invention claimed in each of the claims of the Mooers patent upon which plaintiffs rely and each of said defendants' pistons have the same or substantially the same structure, function and mode of operation and accomplish the same or substantially the same results as the Mooers patented piston as defined by said claims.

as shown by the evidence cited in support of plaintiffs' Exception No. 50.

EXCEPTION NO. 52.

Plaintiffs object and except to each and every statement and conclusion of the Master's Findings of Fact No. 42 (M. R. p. 1194)

> "That defendants' piston, Ex. 1 does not embody the structure, function and mode of operation of the Schmiedeknecht patent in suit."

as contrary to the evidence; see the testimony of plaintiffs' witness Jeffries R. pp. 83, 84, 115, 116 and 117.

EXCEPTION NO. 53.

Plaintiffs object and except to the failure of the Master to adopt item 3 page 26 of plaintiffs' proposed Findings of Fact, summarized briefly as follows:

> That defendants' piston, plaintiffs' Exhibit 1 embodies the invention claimed in each of the

claims of the Schmiedeknecht patent upon which plaintiffs rely and said defendants' piston has the same or substantially the same structure, function and mode of operation and accomplish the same or substantially the same results as the Schmiedeknecht patented piston as defined by said claims;

as shown by the evidence cited in support of plaintiffs' Exception No. 52.

EXCEPTION NO. 54.

Plaintiffs object and except to each and every part of each of the following statements and conclusions of the Master's Finding of Fact No. 43 (M. R. p. 1104)

(a) "That the prior art requires restriction of the (Gulick) patent to the employment of webs which are of sufficient length and thinness to permit flaring of those webs at the top of the skirt;"

as contrary to the evidence; see testimony of defendants' witness Stellman R. p. 566 and plaintiffs' witness Jeffries R. p. 952; and defendants' Exhibit 4-L, the Gulick file wrapper showing consideration of the same prior art patents here relied upon; and see plaintiffs' Exhibits 67 to 70 and 84, showing contrary findings by the Tribunals of the Patent Office and the Courts of the District of Columbia on substantially the same prior art; and see evidence cited in support of plaintiffs' Exceptions Nos. 1 and 2, *supra*, and excepts and objects to the following statement and conclusion:

(b) "that Exhibit 1 does not employ such characteristic webs;"

as contrary to the evidence; see testimony of defendants' witness Stellman R. p. 526, and plaintiffs' witness Jeffries R. pp. 81, 82, 84, 158 to 160; and contrary to the demonstrations of the flexibility of the webs of Exhibit 1 piston before the Court by plaintiffs' witness Jeffries R. p. 954; and see evidence cited in support of plaintiffs' Exception No. 44, *supra*, and objects and excepts to the statements and conclusion:

(c) "that Exhibit 3 does not employ such characteristic webs; and"

as contrary to the evidence; see the testimony of defendants' witness Stellman R. p. 580 and plaintiffs' witness

Jeffries R. pp. 84, 85 and 161; and contrary to the Findings of the Patent Office in the Interferences shown in plaintiffs' Exs. 67 to 70 and 84 that the Gulick patent and the Ray Day application plaintiffs' Exhibit 85 embodied the same invention, see defendants' Exhibit 4-L, pp. 1886 to 1918 and see evidence cited in support of plaintiffs' Exception No. 44, *supra*; and objects and excepts to the statement and conclusion:

(d) "that Exhibits BBB and CCC * * * employ no webs at all."

as contrary to the evidence cited in support of plaintiffs' Exception No. 44, *supra*.

EXCEPTION NO. 55.

Plaintiffs object and except to each and every part of each of the following statements and conclusions of the Master's Finding of Fact No. 44 (M. R. p. 1104)

(a) "that the prior art requires restriction of the patent (Jardine) to the employment of webs which are of sufficient lengths and thinness to permit fixing of these webs at the top of the skirt;"

as contrary to the evidence; see testimony cited in support of plaintiffs' Exception No. 16; and excepts to the statement and conclusion.

(b) "that Ex. 1 does not employ such characteristic webs;"

as contrary to the evidence cited under item (b) of plaintiffs' Exception No. 54, *supra*; and excepts to the statement that

(c) "that Ex. 8 does not employ such characteristic webs;"

as contrary to the Master's holding (M. R. p. 1104) and as contrary to the evidence cited under item (c) of plaintiffs' Exception No. 54, *supra*; and excepts to the statement

(d) "that Exs. BBB and CCC * * * employ no webs at all."

as contrary to the evidence cited under (d) of plaintiffs' Exception No. 54, *supra*.

EXCEPTION NO. 56.

Plaintiffs object and except to the Master's Finding of Fact No. 45 (M. R. p. 1104)

> "That the Maynard patent in suit describes a piston structure in which automatic compensation is not secured unless the groove E is cut into the webs F sufficiently and beyond the inside of the piston head flange to secure web extensions at the top of sufficient length and thinness to permit flexing of these web extensions at the top of the skirt;"

as contrary to the evidence cited in support of plaintiffs' Exception No. 26, *supra*; and excepts to the statement and conclusion:

> "that Ex. 1 does not employ such characteristic webs;"

as contrary to the evidence cited in item (b) of plaintiffs' Exception No. 54, *supra*; and excepts to the statement and conclusion:

> "that Exs. BBB and CCC employ no webs at all."

as contrary to the evidence cited in item (d) of plaintiffs' Exception No. 54, *supra*.

EXCEPTION NO. 57.

Plaintiffs object and except to each of the following statements and conclusions of the Master's Finding of Fact No. 46 (M. R. p. 1105)

> "* * * that the prior art requires such a restriction;"

as contrary to the evidence cited in support of plaintiffs' Exception No. 31, *supra*; and plaintiffs except to the statement and conclusion:

> "that in Exs. 1, BBB, CCC, 3-O, 8 and 9 the connectors are heavy and not of a structure as described in the Mooers patent and"

as contrary to the evidence cited in support of plaintiffs' Exception No. 50, *supra*.

EXCEPTION NO. 58.

Plaintiffs object and except to the statement and conclusion of the Master in his Finding of Fact No. 47 (M. R. p. 1105)

"that in Ex. 1 each wrist pin boss is supported intermediate its ends on the web and not as described and claimed in the Schmiedeknecht patent."

as contrary to the evidence cited in support of plaintiffs' Exception No. 52, *supra*.

EXCEPTION NO. 59.

Plaintiffs object and except to each and every part of the following statement and conclusion of the Master's Finding of Fact No. 48 (M. R. p. 1105)

"That in Ex. 1 automatic compensation is accomplished by what has been termed the 'Keystone relief' and not by any web flexibility at the top;"

as contrary to the evidence cited under plaintiffs' Exceptions Nos. 44, 46, 48 and 50.

EXCEPTION NO. 60.

Plaintiffs object and except to each and every part of the following statement and conclusion of the Master's Finding of Fact No. 49 (M. R. p. 1105)

"that such construction and arrangement does not secure the mode of operation contemplated by the Gulick and Jardine patents."

as contrary to the evidence cited in support of plaintiffs' Exceptions Nos. 44 and 46, *supra*.

EXCEPTION NO. 61.

Plaintiffs object and except to each of the following statements and conclusions of the Master's Finding of Fact No. 50 (M. R. p. 1105)

"That Exs. BBB and CCC do not employ any webs connecting the head with the skirt and, therefore, no webs of such flexibility as contemplated by the Gulick, Jardine and even Maynard patents, if the latter has such webs having such characteristics."

as contrary to the evidence cited in support of plaintiffs' Exceptions Nos. 44, 46, 48, 50, 54, 55 and 56.

EXCEPTION NO. 62.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 51 (M. R. p. 1105)

> "That defendants' pistons, Exs. 1, BBB, CCC, 3-J, 3-O, 8 and 9 employ the essential structure, function and mode of operation of the prior art, more particularly the Franquist patent No. 1,153,902 and Exs. 8 and 9, also the Chenard & Walcker French patent No. 468,595"

as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. 529, 530, 531, 552, 553, 584, 585 and 590 as to Exhibit 1; R. pp. 567 and 568 as to Exhibit BBB; and R. p. 528 as to Exhibit CCC and plaintiffs' witness Jeffries made defendants' witness on cross examination exceeding direct over plaintiff's objection R. pp. 109 and 110 and plaintiffs' witness Jeffries R. pp. 207, 208, 222 and 248.

EXCEPTIONS NOS. 63 TO 97 INC.

Plaintiffs object and except separately to each and every one of the Master's Conclusions of Law Nos. 11 to 42 inclusive, and Nos. 44 to 46, and except and object to each and every statement and conclusion therein contained and set forth as follows:

Plaintiffs' Exception No.	
63	"11 That the Gulick patent is invalid and void as to all claims in issue.
64	"12 That the Gulick patent is invalid and void as to all claims in issue for want of invention.
65	"13 That the Gulick patent is invalid and void as to claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 38, 42 and 43, because (a) of abandonment—at large—by Gulick and plaintiff and intervening privities in title, and (b) of public use by Gulick in this country for more than two years prior to his application for patent.
66	"14 That the Gulick patent is invalid and void as to all claims in issue, additional to those recited in conclusion 13, (a) for want of invention over the pistons abandoned by Gulick and plaintiffs and intervening privities in title for want of invention, and (b) over the

Plaintiffs' Exception No.

pistons in public use by Gulick more than two years prior to his application for patent.

67 "15 That the Gulick patent is destroyed and invalid *in toto*, because (a) of the attempt to broaden the original application as against intervening rights, (b) of material changes in the specification and claims after filing, and (c) of failure to describe and claim as required by R. S. Sec. 4888.

68 "16 That the Gulick patent is invalid and void as to claims 1, 4, 15, 25, 27, 28, 34, 36, 38, 42 and 43 because (a) the subject matter thereof was in public use in this country by Gustave C. Monckmeier more than two years prior to Gulick's application for patent and (b) the subject matter thereof was in public use and on sale in this country by Walter L. Schoengarth more than two years prior to Gulick's application for patent.

69 "17 That the Gulick patent is invalid and void as to all claims in issue additional to those recited in conclusion 16, for want of invention over pistons (a) in public use in this country by Gustave C. Monckmeier more than two years prior to Gulick's application for patent, and (b) in public use and on sale in this country by Walter L. Schoengarth more than two years prior to Gulick's application for patent.

70 "18 That the Jardine patent is invalid and void as to all claims in issue.

71 "19 That the Jardine patent is invalid and void as to all claims in issue for want of invention over the prior art.

72 "20 That the Jardine patent is invalid as to all claims in issue because of failure to describe and claim as required by R. S. Sec. 4888.

73 "21 That the Maynard patent is invalid and void as to all claims in issue.

74 "22 That the Maynard patent is invalid and void as to all claims in issue for want of invention over the prior art.

Plaintiffs' Exception No.	
75	"23 That the Maynard patent is invalid as to all claims in issue because of failure to describe and claim as required by R. S. Sec. 4888.
76	"24 That the Mocers patent is invalid and void as to all claims in issue.
77	"25 That the Mocers patent is invalid and void as to all claims in issue for want of invention over the prior art.
78	"26 That the Mocers patent is destroyed and invalid *in toto* because (a) of the attempt to broaden the original application as against intervening rights, (b) of material changes in the specification and claims after filing, and (c) of failure to describe and claim as required by R. S. Sec. 4888.
79	"27 That the Schmiedeknecht patent is invalid and void as to all claims in issue.
80	"28 That the Schmiedeknecht patent is invalid and void as to all claims in issue for want of invention over the prior art.
81	"29 That the Gulick 1911 piston, Ex. '48 was abandoned to the public by Gulick, plaintiff and intervening privities in title.
82	"30 That the Gulick 1914 piston, Ex. 51 was abandoned to the public by Gulick, plaintiff and intervening privities in title.
83	"31 That the Gulick 1911 piston, Ex. 48, was in public use in this country by Gulick for more than two years prior to his application for patent.
84	"32 That the Gulick 1914 piston, Ex. 51, was in public use in this country by Gulick for more than two years prior to his application for patent.
85	"33 That the Monckmeier pistons, Exs. 3-V and 3-W were in public use in this country for more than two years prior to Gulick's application for patent.
86	"34 That the piston disclosure in the Schoengarth patent 1,174,092 was in public use and on sale in this country for more than two years prior to Gulick's application for patent.

Plaintiffs' Exception No.

87 "35 That a piston of the construction disclosed in the Schoengarth patent 1,174,092, but without the adjusting devices, was in public use and on sale in this country for more than two years prior to Gulick's application for patent.

88 "36 That the sale and use of pistons and activities in the production and development of pistons by the following parties constitute adverse and intervening rights as against Gulick, plaintiff and intervening privities in title of the Gulick patent in suit, Elmer C. Long, Gustave C. Monckmeier, Walter L. Schoengarth, Albert L. Spillman and Kant-Skore Mfg. Co., Stephen D. Hartog, Frank Jardine and Aluminum Company of America, Howard E. Maynard and Maxwell Motor Co., Ray Day, William E. Venner, W. K. Weems and Charles Chadwick.

89 "37 That defendants' pistons, Exs. 1, BBB, CCC, 3-J, 3-O and 8 do not infringe the Gulick patent in suit.

90 "38 That defendants' pistons, Exs. 1, BBB, CCC, and 8 do not infringe the Jardine patent in suit.

91 "39 That defendants' pistons, Exs. 1, BBB and CCC do not infringe the Maynard patent in suit.

92 "40 That defendants' pistons, Exs. 1, BBB, CCC, 3-O, 8 and 9 do not infringe the Mooers patent in suit.

93 "41 That defendants' piston, Ex. 1, does not infringe the Schmiedeknecht patent in suit.

94 "42 That prior art not cited in the answer may be used to show want of invention, particularly as to use of expedients.

95 "44 That plaintiff is not entitled to the relief prayed for in the Bills of Complaint, or any part thereof.

96 "45 That said Bills of Complaint be dismissed.

97 "46 That defendants have and recover against the plaintiff the costs of suit."

and object and except to each of the foregoing Conclusions of Law as based upon erroneous findings of fact as hereinbefore specifically pointed out and as based on erroneous conclusions from the evidence referred to in the foregoing Exceptions, and as based on erroneous application of the law to the facts established by the evidence, and as based on erroneous applications of the law to the Master's Findings of Fact to which plaintiff has heretofore taken specific objections and exceptions.

EXCEPTION NO. 98.

Plaintiffs object and except to the failure of the Master to conclude as a matter of law that the acts testified to by Mönckmeier with regard to the pistons, defendants' Exhibits 3-V and 3-W, constituted no more than an abandoned experiment and did not constitute any public use within the meaning or intent of the statute prior to Gulick's filing date. (For evidence see plaintiffs' Exception No. 38.)

EXCEPTION NO. 99.

Plaintiffs object and except to the failure of the Master to conclude as a matter of law that the acts testified to by Schoengarth constituted no more than an abandoned experiment and did not constitute any public use within the meaning and intent of the statute prior to Gulick's filing date. (For evidence see plaintiffs' Exception No. 40.)

EXCEPTION NO. 100.

Plaintiffs object and except to the failure and refusal of the Master to adopt as his conclusion of law, the substance of Item 6 of page 5, of plaintiffs' proposed Conclusions of Law, in that defendants are bound by the testimony of Gulick on the cross examination, exceeding the direct examination over plaintiffs' objection, that Gulick's work prior to his filing date was experimental and never amounted to public use of any piston covered by his patent in suit. (For evidence see R. pp. 754, 755 and 768.)

EXCEPTION NO. 101.

Plaintiffs object and except to the failure and refusal of the Master to conclude as proposed by plaintiffs in Items 11, 12 and 13 on page 6, plaintiffs' proposed con-

clusions of law that Gulick was the original, first and sole inventor of the invention described and claimed in the Gulick patent No. 1,815,733, and that said patent is valid and sufficient in law particularly as to claims 1, 4, 11, 12, 13, 15, 18, 22, 27, 28, 29, 30, 33, 34, 35, 36, 37, 38, 41, 42 and 43, and the Gulick patent, describing and claiming a pioneer invention, is entitled to a liberal interpretation and a broad range of equivalents. (For evidence, see that cited in Exceptions Nos. 1 to 12 inc., *supra*.)

EXCEPTION NO. 102.

Plaintiffs object and except to the failure and refusal of the Master to adopt plaintiffs' proposed conclusions of law set forth in Items 14 to 19 inclusive, pages 6 and 7 thereof, in substance that defendants have infringed the Gulick patent by the manufacture, use or sale of pistons like Defendant's Exhibits 1, 8, BBB, CCC, 3-J, 3-O, and the particular claims of the Gulick patent with reference to each exhibit as specifically set forth in plaintiffs' proposed conclusions. (For evidence, see that cited in Exceptions Nos. 44, 54, 59, 60 and 61, *supra*.)

EXCEPTION NO. 103.

Plaintiffs object and except to the Master's failure and refusal to adopt the conclusion of law proposed by plaintiffs in items 1 and 2 of page 8 of their proposed conclusions of law, in substance that Jardine was the original, first, and sole inventor of the invention disclosed and claimed in Jardine patent No. 1,763,523 and that the said Jardine patent is valid and sufficient in law particularly as to claims 1 and 2 and claims 4 to 11 inclusive thereof. (For evidence, see that cited in Exceptions Nos. 3 and 14 to 18 inc., *supra*.)

EXCEPTION NO. 104.

Plaintiffs object and except to the Master's failure and refusal to adopt the conclusion of law proposed by plaintiffs in items 3 to 6 inclusive on page 8 of their proposed conclusions, in substance that the defendants have infringed the Jardine patent No. 1,763,523 by making, using and selling, pistons like defendants' Exhibits 1, 8, BBB and CCC with respect to the claims of said patent specifically set forth with relation to each exhibit in said items of plaintiffs' proposed conclusions. (For evidence, see that cited in Exceptions Nos. 46, 55, 59, 60 and 61, *supra*.)

EXCEPTION NO. 105.

Plaintiffs object and except to the Master's failure and refusal to adopt as his conclusion of law items 1 and 2 on page 9 of plaintiffs' proposed conclusions of law, in substance that Maynard was the original, first, and sole inventor of the invention described and claimed in the Maynard patent No. 1,655,968 and that the said Maynard patent is valid and sufficient in law as to all the claims thereof. (For evidence, see that cited in Exceptions Nos. 3 and 19 to 26 Inc., *supra*.)

EXCEPTION NO. 106.

Plaintiffs object and except to the Master's failure and refusal to adopt as a conclusion of law items 3 to 5 inclusive on page 9 of plaintiffs' proposed conclusions of law, in substance that defendants infringed the Maynard patent No. 1,655,968 by making, using and selling, pistons like defendants' Exhibits 1, BBB and CCC with respect to the claims of said patent specifically set out with relation to each exhibit in the said items of plaintiffs' proposed conclusions. (For evidence, see that cited in Exceptions Nos. 48, 56, 59 and 61, *supra*.)

EXCEPTION NO. 107.

Plaintiffs object and except to the Master's failure and refusal to adopt as his conclusion of law items 1 and 2 of page 10 of plaintiffs' proposed conclusions of law, in substance that Mooers was the original, first, and sole inventor of the invention described and claimed in the Mooers patent No. 1,402,309 and that the said Mooers patent is valid and sufficient in law as to claims 1 to 4 inclusive and 6, 8, 10 and 11 thereof. (For evidence, see that cited in Exceptions Nos. 3 and 27 to 33 Inc., *supra*.)

EXCEPTION NO. 108.

Plaintiffs object and except to the Master's failure and refusal to adopt as a conclusion of law items 3 to 8 inclusive of page 10 of plaintiffs' proposed conclusions of law, in substance that defendants infringed the Mooers patent No. 1,402,309 by making, using and selling, pistons like defendants' Exhibits 1, 6, 9, BBB, CCC and 3-O with respect to the claims of said patent specifically set out with relation to each exhibit in the said items of plaintiffs' proposed conclusions. (For evidence, see that cited in Exceptions Nos. 50 and 57, *supra*.)

EXCEPTION NO. 109.

Plaintiffs object and except to the failure and refusal of the Master to adopt as his conclusion of law the substance of Items 1 and 2 on page 11 of Plaintiffs' Proposed Conclusions of Law to the effect that Schmiedeknecht was the original, first and sole inventor of the invention described and claimed in the Schmiedeknecht patent No. 1,256,265, and that the said patent is valid and sufficient in law, particularly as to claims 1 and 3 thereof. (For evidence, see that cited in Exceptions Nos. 3, 34 and 35, *supra*.)

EXCEPTION NO. 110.

Plaintiffs object and except to the Master's failure and refusal to adopt as his conclusion of law the substance of Item 3 on page 11 of Plaintiffs' Proposed Conclusions of Law to the effect that defendants have infringed claims 1 and 3 of the Schmiedeknecht patent in suit by making, using, and selling pistons like defendants' Exhibit 1. (For evidence, see that cited in Exceptions Nos. 52 and 58, *supra*.)

EXCEPTION NO. 111.

Plaintiffs object and except to the failure and refusal of the Master to adopt as his conclusion of law that the plaintiffs are entitled to the relief prayed for in each Bill of Complaint, and their costs in these suits to be taxed.

And plaintiffs file their foregoing Exceptions this 26th day of February, 1934.

WM. C. McCOY,
F. O. RICHEY,
Solicitors for Plaintiffs.

EVANS & McCOY,
RICHEY & WATTS,
Of Counsel for Plaintiffs.

Service of a copy of the foregoing, Plaintiffs' Exceptions to the Report of the Special Master, acknowledged this 26th day of February, 1934.

KWIS, HUDSON & KENT,
Solicitors for Defendants.

MEMORANDUM ON EXCEPTIONS TO MASTER'S REPORT.

(Filed July 6, 1934.)

[Case No. 4045.]

JONES, *J.*:

Upon due consideration and review of the issues and matters involved and heard before the Master in these three cases, and from a consideration of the full report of the Master, and the more than ample briefs of the parties, it is the judgment of the Court that the exceptions to the report of the Master be overruled; that the findings and conclusions of the Master be approved and adopted as those of the Court; and that the report of the Master be confirmed.

The principle reasserted in the opinion of the Supreme Court in *Radio Corporation of America vs. Radio Engineering Laboratories, Inc.*, 54 Supreme Court 752, has been noted in considering the weight to be given the earlier decisions of the Patent Office tribunals in respect of some phases of prior invention and public use. If the application of such principle is thought to be pertinent here and persuasive as against the Master's report, the eye, the understanding, and the record in the cases, in my opinion, supply the necessary weight to overcome the heavy burden cast upon the defendants.

Due exceptions may be entered for the plaintiffs, and findings and conclusions in accordance with the Master's report may be prepared and presented.

JONES,

U. S. District Judge.

July 6th, 1934.

FINAL DECREE.

(Filed July 27, 1934.)

[Case No. 4045.]

This cause having been referred to Wm. B. Woods, Esquire, of Cleveland, Ohio, as Special Master, by an Order of this Court made September 14, 1932; said cause having come to be heard before said Special Master on the pleadings and proofs and after oral arguments made and briefs submitted by counsel for plaintiffs and counsel for defendant, said Special Master having, on January 27, 1934, reported to this Court his Findings of Fact, Conclusions of Law, and his Memorandum; and plaintiffs having filed their exceptions to the Report of the Special Master and briefs having been submitted by counsel for plaintiffs and counsel for defendant;

Thereupon, upon due consideration and review of the issues, and matters involved and heard before the Master, and from a consideration of the full Report of the Master and the briefs of the parties;

IT IS ORDERED, ADJUDGED and DECREED as follows:

I.

That Plaintiffs' Exceptions to the Report of the Master be overruled; that the Findings of Fact and Conclusions of Law of the Master be approved and adopted as those of this Court, and that the Report of the Master be in all respects confirmed; but that due exceptions be entered for the plaintiffs.

That the Bill of Complaint in this cause filed by plaintiffs against defendant be, and the same hereby is, dismissed on the merits for want of equity as to each and all of the patents in suit and at plaintiffs' costs, that the costs be taxed by this Clerk of this Court and that defendant have execution therefor as at law.

JONES,
United States District Judge.

Cleveland, Ohio
July 26, 1934.

Approved as to form.

EVANS & MCCOY,
Attorneys for Plaintiffs.

KWIS, HUDSON & KENT,
Attorneys for Defendant.

PETITION FOR APPEAL.

(Filed October 17, 1934.)

[Case No. 4045.]

Your petitioners, the above named Plaintiffs, The Cleveland Trust Company and Chrysler Corporation, each feeling itself aggrieved by the decree made and entered herein on the 27th day of July, 1934, dismissing the above entitled cause, do hereby severally and do hereby jointly appeal from said decree to the United States Circuit Court of Appeals for the Sixth Circuit for the reasons specified in the assignment of errors which is filed herewith, and each and both pray that such appeal be allowed and that a citation issue as provided by law and that a transcript of the record, proceedings, documents and exhibits upon which said decree was based, be duly authenticated and transmitted to the United States Circuit Court of Appeals for the Sixth Circuit.

Your petitioners further pray that the amount of security to be furnished by the plaintiffs may be fixed by the order allowing this appeal.

WM. C. McCOY,
F. O. RICHEY,

Solicitors for Plaintiffs, The Cleveland Trust Company, and Chrysler Corporation.

Service of the above petition and of the accompanying assignment of errors, and receipt of copies of the same, is acknowledged this 17th day of October, 1934.

KWIS, HUDSON & KENT,

Solicitors for Defendant.

ORDER ALLOWING APPEAL.

(Entered October 17, 1934 by Paul Jones, Judge.)

[Case No. 4045.]

On petition by Plaintiffs, The Cleveland Trust Company and Chrysler Corporation, for allowance of appeal to the United States Circuit Court of Appeals for the Sixth Circuit from the decree entered in the above entitled cause on the 27th day of July, 1934, the petition is

granted and it is ordered that the appeal be and the same is hereby allowed, upon giving a bond as required by law, and that a certified transcript of the record be forthwith transmitted to the United States Circuit Court of Appeals for the Sixth Circuit.

It is further ordered that the bond on appeal be fixed at the sum of $500.00.

JONES,
U. S. District Judge.

Cleveland, Ohio,
October ..., 1934.

Service of the above order and receipt of a copy of the same is acknowledged this .... day of October, 1934.

.....
Solicitors for Defendant.

ASSIGNMENT OF ERRORS.

(Filed October 17, 1934.)

[Case No. 4045.]

Now come plaintiffs, The Cleveland Trust Company and Chrysler Corporation, and present with their accompanying petition for appeal from the final decree entered herein, the following assignment of errors, which are hereinafter grouped with respect to subject matter:

GROUP A.

Assignment of errors relating to the validity of Gulick patent No. 1,815,733.

1. The Court erred in failing to find and hold the Gulick patent No. 1,815,733 good and valid in law, particularly as to claims 1, 11, 12, 13, 15, 18, 30, 33, 35, 38,

41, 42 and 43 thereof, and in failing to sustain plaintiffs' exceptions Nos. 2, 3 and 101.

2. The Court erred in approving and adopting the Special Master's finding of fact No. 11, and in not sustaining plaintiffs' exception (No. 1) to the following statements in the said finding of fact No. 11:

(a) "That the pistons of the Gulick patent embodies the fundamental structure of the Franquist patent No. 1,153,902

(b) and that the piston of the Franquist patent is operative to substantially compensate for expansion

(c) that the piston of the Gulick patent employs essentially the webs of the Spillman & Mooers patent No. 1,092,870 and of the Chenard & Walcker French patent No. 468,595 . . .

(d) that the web construction of the Gulick patent differentiates from those of Spillman & Mooers and Chenard & Walcker simply in matter of design involving mechanical skill

(e) that splitting of the skirts of the Franquist, Spillman & Mooers and Chenard & Walcker patents by through slotting was within the purview of one skilled in the art."

3. The Court erred in approving and adopting the Special Master's conclusion of law No. 12,

"That the Gulick patent is invalid and void as to all claims in issue for want of invention."

and in not sustaining plaintiffs' exception No. 64 to the aforesaid conclusion of law.

4. The Court erred in approving and adopting the Special Master's conclusion of law No. 34,

"That the piston disclosure in the Schoengarth patent 1,174,092 was in public use and on sale in this country for more than two years prior to Gulick's application for patent."

and in not sustaining plaintiffs' exception (No. 86) to the aforesaid conclusion of law No. 34.

5. The Court erred in approving and adopting the Special Master's conclusion of law No. 35,

"That a piston of the construction disclosed in the Schoengarth patent 1,174,092, but without

the adjusting devices, was in public use and on sale in this country for more than two years prior to Gulick's application for patent."

and in not sustaining plaintiffs' exception (No. 37) to the aforesaid conclusion of law No. 35.

6. The Court erred in approving and adopting the Special Master's conclusions of law Nos. 16 and 17, that the Gulick patent is invalid and void as to all claims in issue because of pistons

"* * * (b) in public use and on sale in this country by Walter L. Schoengarth, more than two years prior to Gulick's application for patent,"

and for want of invention over such pistons, and in not sustaining plaintiffs' exceptions (Nos. 68 and 69) to the aforesaid conclusions of law Nos. 16 and 17.

7. The Court erred in approving and adopting the Special Master's finding of fact No. 36,

"That for more than two years prior to the application of the patent in suit, Walter L. Schoengarth made and sold at Ironwood, Michigan, pistons of the construction shown and described in the Schoengarth patent 1,174,092 but omitting the adjusting device; that such pistons functioned to compensate for expansion; that any reduction of head diameter to circumferential slot was a matter within the purview of a skilled mechanic; and that the Schoengarth pistons were publicly used and sold in this country more than two years prior to Gulick's application for patent. That for more than two years prior to the application of the patent in suit, Walter L. Schoengarth made and sold at Ironwood, Michigan, pistons of the construction shown and described in the Schoengarth patent 1,174,092. That the testimony of Schoengarth is reasonably corroborated, satisfactory and reliable. That the omission of the adjusting devices is within the purview of any skilled mechanic."

and in not sustaining plaintiffs' exception (No. 40) to the aforesaid finding of fact No. 36.

8. The Court erred in approving and adopting the Special Master's finding of fact No. 35 and in not sustaining plaintiffs' exception (No. 38) to the following statements in the aforesaid finding of fact No. 35:

(a) "That the Monckmeier pistons, Exhibits 3-V and 3-W, were in use by Gustave C. Monckmeier in this country in his automobile, for more than two years prior to the Gulick application for patent; that such pistons embodied a T-slot disposed intermediate the wrist pin bosses with the horizontal of the T below the bottom ring land and with the vertical of the T intermediate the bosses.

(b) that such T-slotting functioned to compensate for expansion; that any reduction in head diameter to the horizontal slot involved mere mechanical skill;

(c) that such use of the Monckmeier pistons more than two years prior to the application of the Gulick patent in suit was open and not in secret but known to others and in fact public; and

(d) that the testimony of Monckmeier and his corroborating witnesses is reasonably satisfactory and reliable."

9. The Court erred in approving and adopting the Special Master's conclusion of law No. 33:

"That the Monckmeier pistons, Exs. 3-V and 3-W were in public use in this country for more than two years prior to Gulick's application for patent."

and in not sustaining plaintiffs' exception (No. 85) to the aforesaid conclusion of law No. 33.

10. The Court erred in approving and adopting the Special Master's conclusions of law Nos. 16 and 17, that the Gulick patent is invalid and void as to all claims in issue because of pistons

"* * * (a) in public use in this country by Gustave C. Monckmeier more than two years prior to Gulick's application for patent * * *"

and for want of invention over such pistons, and in not sustaining plaintiffs' exceptions Nos. 68 and 69 to the aforesaid conclusions of law Nos. 16 and 17.

11. The Court erred in approving and adopting the Special Master's finding of fact No. 12, and in not sustaining plaintiff's exception (No. 4) to the following statements and conclusions contained in the aforesaid finding of fact No. 12,

"That by admissions of plaintiffs' witness Gulick, Gulick abandoned and had in public use in this country during the year 1911, a piston exemplified by Exhibit 48, and during the year 1914, a piston exemplified by Exhibit 51; * * *."

12. The Court erred in approving and adopting the Special Master's conclusion of law No. 31,

"That the Gulick 1911 piston, Ex. 48, was in public use in this country by Gulick for more than two years prior to his application for patent."

and in not sustaining plaintiffs' exception (No. 83) to the aforesaid conclusion of law No. 31.

13. The Court erred in approving and adopting the Special Master's conclusion of law No. 32,

"That the Gulick 1914 piston, Ex. 51, was in public use in this country by Gulick for more than two years prior to his application for patent."

and in not sustaining plaintiffs' exception (No. 84) to the aforesaid conclusion of law No. 32.

14. The Court erred in approving and adopting the statements in the Special Master's conclusions of law Nos. 13 and 14, that the Gulick patent is invalid and void as to claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 38, 42 and 43, because

"* * * (b) of public use by Gulick in this country more than two years prior to his application for patent."

and as to all other claims in issue for want of invention over such pistons, and in not sustaining plaintiffs' exceptions (Nos. 65 and 66) to the aforesaid conclusions of law Nos. 13 and 14.

15. The Court erred in approving and adopting the Special Master's finding of fact No. 34 and in not sustaining plaintiffs' exception (No. 36) to the Special Master's use of the word "admission" in his finding of fact No. 34, and to the following statement and conclusion contained in said finding of fact No. 34,

(a) "* * * that the piston Exhibit 51 was not given a block test for the reason given by Gulick that he was satisfied with previous tests. * * *"

16. The Court erred in approving and adopting the Special Master's conclusion of law No. 15 and in not sus-

taining plaintiffs' exception (No. 67) to the following statement in the Special Master's conclusion of law No. 15:

"That the Gulick patent is destroyed and invalid in toto, because * * * (c) of failure to describe and claim as required by Sec. 4888 R. S."

17. The Court erred in approving and adopting the Special Master's finding of fact No. 16,

"That the Gulick patent does not describe in sufficient detail to enable one skilled in the art to reproduce the same, the length and thickness of the webs required to secure flexibility."

and in not sustaining plaintiffs' exception (No. 11) to the aforesaid finding of fact No. 16.

18. The Court erred in approving and adopting the Special Master's conclusion of law No. 15,

"That the Gulick patent is destroyed and invalid in toto, because (a) of the attempt to broaden the original application as against intervening rights, * * *"

and in not sustaining plaintiffs' exception (No. 67) to the aforesaid conclusion of law No. 15.

19. The Court erred in approving and adopting the Special Master's finding of fact No. 34 and in not sustaining plaintiffs' exception (No. 36) to the following statement and conclusion embodied in the aforesaid finding of fact No. 34,

(b) "* * * that no effort was made to place the embodiments of the 1911 and 1914 pistons in the application of the Gulick patent. * * *"

20. The Court erred in approving and adopting the Special Master's conclusion of law No. 29,

"That the Gulick 1911 piston, Ex. 48, was abandoned to the public by Gulick, plaintiff and intervening privities in title."

and in not sustaining plaintiffs' exception (No. 81) to the aforesaid conclusion of law No. 29.

21. The Court erred in approving and adopting the Special Master's conclusion of law No. 30:

"That the Gulick 1914 piston, Ex. 51, was abandoned to the public by Gulick, plaintiff and intervening privities in title."

and in not sustaining plaintiffs' exception (No. 82) to the aforesaid conclusion of law No. 30.

22. The Court erred in approving and adopting the Special Master's conclusions of law Nos. 13 and 14 and in not sustaining plaintiffs' exceptions (Nos. 65 and 66) to the statements in the Special Master's conclusions of law Nos. 13 and 14, in substance that the Gulick patent is invalid and void as to the claims in issue because the Gulick invention was abandoned—at large—to the public by Gulick and plaintiffs and intervening privities in title and for want of invention over pistons abandoned by Gulick and plaintiffs and intervening privities in title.

23. The Court erred in approving and adopting the Special Master's finding of fact No. 15,

> "That after the filing of the Gulick application, his application was materially modified, both as to the specification and claims without warrant therefor in the original disclosure."

and in not sustaining plaintiffs' exception (No. 9) to the aforesaid finding of fact No. 15.

24. The Court erred in approving and adopting the Special Master's conclusion of law No. 15 and in not sustaining plaintiffs' exception (No. 67) to the following holding in the Special Master's conclusion of law No. 15:

> "That the Gulick patent is destroyed and invalid in toto because, * * * (b) of material changes in the specification and claims after filing, * * *."

25. The Court erred in approving and adopting the Special Master's finding of fact No. 14,

> "That the Gulick specification, while pending in the Patent Office, was broadened beyond the original disclosure while pistons were produced, used, and sold by the following parties:
>
> Elmer C. Long
> Gustave C. Mendtmeier
> Walter L. Schoemgarth
> Albert L. Spillman
> Kant-Shore Mfg. Co.
> Stephen D. Hartog
> Frank Jardine
> Aluminum Co. of America
> Howard E. Maynard
> Maxwell Motor Co.
> Ray Day
> William E. Venner"

and in not sustaining plaintiffs' exceptions (Nos. 5 and 6) to the aforesaid finding of fact No. 14.

26. The Court erred in approving and adopting the Special Master's conclusion of law No. 36,

> "That the sale and use of pistons and activities in the production and development of pistons by the following parties constitute adverse and intervening rights as against Gulick, plaintiffs and intervening privities in title of the Gulick patent in suit: Elmer C. Long, Gustave C. Monckmeier, Walter L. Schoengarth, Albert L. Spillman and Kant-Skore Mfg. Co., Stephen D. Hartog, Frank Jardine and Aluminum Company of America, Howard E. Maynard and Maxwell Motor Co., Ray Day, William E. Venner, W. K. Weems and Charles Chadwick."

and in not sustaining plaintiffs' exception (No. 88) to the aforesaid conclusion of law No. 36.

27. The Court erred in approving and adopting the Special Master's finding of fact No. 37 and in not sustaining the plaintiffs' exception (No. 42) to the following statements and conclusions in the Special Master's finding of fact No. 37:

> "That one Elmer C. Long, in March, 1916 exhibited to Louis Stellman and William Venner at Syracuse, New York, a six slotted piston of the construction shown by Exhibits Y and A respectively. That six slotted pistons of the construction shown in Exhibit A and also in Exhibit F were sold by Long to Venner while Venner was at South Bend, Indiana, as early as 1917, and that during the year 1917 Venner sold such pistons as replacements in Franklin automobiles; and that Venner continued to sell such pistons furnished him by Long and of the construction shown in Exhibits E, F and G from 1918 to 1926. That a piston of the construction shown in the Long patent 1,395,441 with a T-slot was tested at Franklin Automobile Co., at Syracuse, New York, July, 1918 as admitted by plaintiffs' witness, Burns. That during the year 1918, Elmer C. Long manufactured and sold six-slotted pistons of the construction shown in Exhibits E, F, G and R for replacement in automobiles and that such pistons were actually

used during the year 1918 in automobiles; * * * That the Long pistons of 1917-1926 were successful pistons and from 1917 to 1922 were the only commercial pistons which automatically compensated for expansion. * * *"

GROUP B.

Assignment of errors relating to infringement of the Gulick patent in suit.

28. The Court erred in not holding that defendant has infringed the Gulick patent No. 1,815,733, particularly as to claims 1, 11, 12, 13, 15, 18, 30, 33, 35, 38, 41, 42 and 43 thereof, and in failing to sustain plaintiffs' exceptions Nos. 45 and 102.

29. The Court erred in approving and adopting the Special Master's finding of fact No. 38,

"That defendants' pistons, Ex. 1, * * * do not embody the structure, function and mode of operation of the Gulick patent in suit."

and in not sustaining plaintiffs' exception (No. 44) to the aforesaid finding of fact No. 38.

30. The Court erred in approving and adopting the Special Master's finding of fact No. 43 and in not sustaining plaintiffs' exception (No. 54) to the following statements and conclusions in the aforesaid finding of fact No. 43:

(a) " * * that the prior art requires restriction of the (Gulick) patent to the employment of webs which are of sufficient length and thinness to permit flexing of those webs at the top of the skirt; and

(b) that Exhibit 1 does not employ such characteristic webs * * *"

31. The Court erred in approving and adopting the Special Master's finding of fact No. 46,

"That in Ex. 1 automatic compensation is accomplished by what has been termed the 'Keystone relief' and not by any web flexibility at the top; * * * and that such a construction and arrangement does not secure the operation contemplated by the Gulick, Jardine and Maynard patents."

and in not sustaining plaintiffs' exception (No. 59) to the aforesaid finding of fact No. 48.

32. The Court erred in approving and adopting the Special Master's finding of fact No. 51,

> "That defendants' pistons, Exs. 1, * * * employ the essential structure, function and mode of operation of the prior art, more particularly the Franquist patent No. 1,153,902 and Exs. 8 and 9, also the Chenard & Walcker French patent No. 468,595."

and in not sustaining plaintiffs' exception (No. 62) to the aforesaid finding of fact No. 51.

33. The Court erred in approving and adopting the Special Master's conclusion of law No. 37,

> "that defendant's pistons, Exs. 1, * * * do not infringe the Gulick patent in suit."

and in not sustaining plaintiffs' exception (No. 89) to the aforesaid conclusion of law.

GROUP C.

Assignment of errors relating to validity of the Jardine patent No. 1,763,523.

34. The Court erred in failing to find and hold the Jardine patent No. 1,763,523 good and valid in law, particularly as to claims 1, 2, and 4 to 11, inclusive, thereof, and in failing to sustain plaintiffs' exceptions Nos. 16 and 103.

35. The Court erred in approving and adopting the Special Master's finding of fact No. 17 and in not sustaining plaintiffs' exception (No. 13) to the following statements in the Special Master's finding of fact No. 17:

(a) "That the Jardine patent embodies the fundamental structure of Franquist patent No. 1,153,902,

(b) that it employs essentially the slipper piston structure of the Ricardo patent No. 1,294,633, and

(c) that the splitting of the slippers of the Ricardo patent was within the purview of one skilled in the art."

36. The Court erred in approving and adopting the Special Master's finding of fact No. 18,

"That the Jardine patent piston differs from the piston of the Long patent No. 1,872,772 in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 14) to the aforesaid finding of fact No. 18.

37. The Court erred in approving and adopting the Special Master's finding of fact No. 19,

"That the Jardine piston differs from the piston of the Gulick patent in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 15) to the aforesaid finding of fact No. 19.

38. The Court erred in approving and adopting the Special Master's conclusion of law No. 19,

"That the Jardine patent is invalid as to all claims in issue for want of invention over the prior art."

and in not sustaining plaintiffs' exception (No. 71) to the aforesaid conclusion of law No. 19.

39. The Court erred in approving and adopting the Special Master's finding of fact No. 20,

"That the Jardine patent does not describe in sufficient detail to enable one skilled in the art to reproduce the same, the length and thickness of the webs required to secure flexibility."

and in not sustaining plaintiffs' exception (No. 17) to the aforesaid finding of fact No. 20.

40. The Court erred in approving and adopting the Special Master's conclusion of law No. 20,

"That the Jardine patent is invalid as to all claims in issue because of failure to describe and claim as required by Sec. 4888 R. S."

and in not sustaining plaintiffs' exception (No. 72) to the aforesaid conclusion of law No. 20.

GROUP D.

Assignment of errors relating to infringement of Jardine patent in suit.

41. The Court erred in not holding that defendant has infringed the Jardine patent No. 1,763,523, particu-

larly as to claims 1, 2 and 4 to 11, inclusive, thereof, and in failing to sustain plaintiffs' exceptions Nos. 47 and 104.

42. The Court erred in approving and adopting the Special Master's finding of fact No. 39,

> "That defendant's pistons, Exhibit 1, * * * do not embody the structure, function and mode of operation of the Jardine patent in suit."

and in not sustaining plaintiffs' exception (No. 46) to the aforesaid finding of fact No. 39.

43. The Court erred in approving and adopting the Special Master's finding of fact No. 44 and in not sustaining plaintiffs' exception (No. 55) to the following statements and conclusions in finding of fact No. 44:

(a) "* * * that the prior art requires restriction of the patent (Jardine) to the employment of webs which are of sufficient lengths and thinness to permit flexing of these webs at the top of the skirt;" and

(b) that Ex. 1 does not employ such characteristic webs."

44. The Court erred in approving and adopting the Special Master's conclusion of law No. 38,

> "That defendants' pistons, Exs. 1, * * * do not infringe the Jardine patent in suit."

and in not sustaining plaintiffs' exception (No. 90) to the aforesaid conclusion of law No. 38.

GROUP E.

Assignment of errors relating to validity of the Maynard patent No. 1,655,968.

45. The Court erred in failing to find and hold the Maynard patent No. 1,655,968 good and valid in law as to all claims thereof, and in failing to sustain plaintiffs' exceptions Nos. 26 and 105.

46. The Court erred in approving and adopting the Special Master's finding of fact No. 21 and in not sustaining plaintiffs' exception (No. 19) to the following statements in the Special Master's finding of fact No. 21:

> "The Maynard patent embodies the fundamental structure of the Franquist patent No. 1,153,902, and that the splitting of the skirt by through

and through slotting was within the purview of one skilled in the art."

47. The Court erred in approving and adopting the Special Master's finding of fact No. 22,

"That the Maynard patent differs from the piston of the Jardine patent 1,763,523 in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 20) to the aforesaid finding of fact No. 22.

48. The Court erred in approving and adopting the Special Master's finding of fact No. 23,

"That the Maynard patent piston differs from the piston of the Long patent 1,395,441 in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 21) to the aforesaid finding of fact No. 23.

49. The Court erred in approving and adopting the Special Master's finding of fact No. 24,

"That the Maynard patent piston differs from the piston of the Gulick patent in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 22) to the aforesaid finding of fact No. 24.

50. The Court erred in approving and adopting the Special Master's finding of fact No. 25,

"That the Maynard patent piston differs from the piston of the Schmiedeknecht patent in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 23) to the aforesaid finding of fact No. 25.

51. The Court erred in approving and adopting the Special Master's finding of fact No. 26,

"That the Maynard patent piston differs from the piston of the Ricardo patent No. 1,294,883 in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 24) to the aforesaid finding of fact No. 26.

52. The Court erred in approving and adopting the Special Master's finding of fact No. 27,

"That the Maynard patent piston differs from the piston of the Hives patent 140,998 in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 25) to the aforesaid finding of fact No. 27.

53. The Court erred in approving and adopting the Special Master's conclusion of law No. 22,

"That the Maynard patent is invalid and void as to all claims in issue for want of invention over the prior art."

and in not sustaining plaintiffs' exception (No. 74) to the aforesaid conclusion of law No. 22.

54. The Court erred in approving and adopting the Special Master's conclusion of law No. 23,

"That the Maynard patent is invalid as to all claims in issue because of failure to describe and claim as required by R. S. Sec. 4888,"

and in not sustaining plaintiffs' exception (No. 75) to the aforesaid conclusion of law No. 23.

GROUP F.

Assignment of errors relating to infringement of Maynard patent in suit.

55. The Court erred in failing to find and hold that defendant has infringed the Maynard patent No. 1,655,968, and in failing to sustain plaintiffs' exceptions Nos. 49 and 106.

56. The Court erred in approving and adopting the Special Master's finding of fact No. 40,

"That defendant's pistons, Ex. 1, * * * do not embody the structure, function and mode of operation of the Maynard patent in suit."

and in not sustaining plaintiffs' exception (No. 48) to the aforesaid finding of fact No. 40.

57. The Court erred in approving and adopting the Special Master's finding of fact No. 45 and in not sustaining plaintiffs' exception (No. 56) to the following statements in the Special Master's finding of fact No. 45:

(a) "That the Maynard patent in suit describes a piston structure in which automatic compensation is not secured unless the groove E is cut into the webs F sufficiently and beyond the inside of

the piston head flange to secure web extensions at the top of sufficient length and thinness to permit flexing of these web extensions at the top of the skirt; and

(b) that Ex. 1 does not employ such characteristic webs."

58. The Court erred in approving and adopting the Special Master's conclusion of law No. 39,

"That the defendant's pistons, Ex. 1, * * * do not infringe the Maynard patent in suit."

and in not sustaining plaintiffs' exception (No. 91) to the aforesaid conclusion of law No. 39,

GROUP G.

Assignment of errors relating to validity of Mooers patent No. 1,402,309.

59. The Court erred in failing to find and hold that Mooers patent No. 1,402,309 is good and valid in law, particularly as to claims 1 to 4 inclusive, 6, 8, 10 and 11 thereof, and in failing to sustain plaintiffs' exceptions Nos. 31 and 107.

60. The Court erred in approving and adopting the Special Master's finding of fact No. 28,

"That the Mooers patent embodies the fundamental structure of the Franquist patent No. 1,153,902 and that the employment of narrow connectors was within the purview of one skilled in the art."

and in not sustaining plaintiffs' exception (No. 27) to the aforesaid finding of fact No. 28.

61. The Court erred in approving and adopting the Special Master's finding of fact No. 29,

"That the Mooers patent piston differs from the piston of the Spillman & Mooers patent No. 1,092,870 in suit in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 28) to the aforesaid finding of fact No. 29.

62. The Court erred in approving and adopting the Special Master's finding of fact No. 30,

"That the Mooers patent piston differs from the piston of the Chenard & Walcker patent No.

468,595 in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 29) to the aforesaid finding of fact No. 30.

63. The Court erred in approving and adopting the Special Master's finding of fact No. 31;

"That the Mooers patent piston differs from the piston of the Gulick 1911 and 1914 pistons (Exhibits 48 and 51) in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 30) to the aforesaid finding of fact No. 31.

64. The Court erred in approving and adopting the Special Master's conclusion of law No. 25,

"That the Mooers patent is invalid and void as to all claims in issue for want of invention over the prior art."

and in not sustaining plaintiffs' exception (No. 77) to the aforesaid conclusion of law No. 25.

65. The Court erred in approving and adopting the Special Master's finding of fact No. 32,

"That after the filing of the Mooers application, his application was materially modified both as to specification and claims without warrant therefor in the original disclosure."

and in not sustaining plaintiff's exception (No. 32) to the aforesaid finding of fact No. 32.

66. The Court erred in approving and adopting the Special Master's conclusion of law No. 26, which is as follows:

"That the Mooers patent is destroyed and invalid in toto because (a) of the attempt to broaden the original application as against intervening rights, (b) of material changes in the specification and claims after filing, and (c) of failure to describe and claim as required by Sec. 4888 R. S."

and in not sustaining plaintiffs' exception (No. 78) to the aforesaid conclusion of law No. 26.

GROUP H.

Assignment of errors relating to infringement of Mooers patent in suit.

67. The Court erred in failing to find and hold that defendant has infringed the Mooers patent No. 1,402,309, and in failing to sustain plaintiffs' exceptions Nos. 51 and 108.

68. The Court erred in approving and adopting the Special Master's finding of fact No. 41,

> "That defendant's pistons, Ex. 1, * * * do not embody the structure, function and mode of operation of the Mooers patent in suit."

and in not sustaining plaintiffs' exception (No. 50) to the aforesaid finding of fact No. 41.

69. The Court erred in approving and adopting the Special Master's finding of fact No. 46 and in not sustaining plaintiffs' exception (No. 57) to the following statements and conclusions included in the Special Master's finding of fact No. 46:

(a) "* * * that the prior art requires such a restriction; (of the connectors from the head to the top of the skirt in the Mooers patent to narrow connectors of restricted cross sections);

(b) that in Ex. 1 * * * the connectors are heavy and not of a structure as described in the Mooers patent * * *"

70. The Court erred in approving and adopting the Special Master's conclusion of law No. 40,

> "That defendant's pistons, Ex. 1, * * * do not infringe the Mooers patent in suit."

and in not sustaining plaintiffs' exception (No. 92) to the aforesaid conclusion of law No. 40.

GROUP I.

Assignment of errors relating to the validity of Schmiedeknecht patent No. 1,256,265.

71. The Court erred in failing to find and hold the Schmiedeknecht patent No. 1,256,265 good and valid in law particularly as to claims 1 and 3 thereof, and in failing to sustain plaintiffs' exceptions Nos. 35 and 109.

72. The Court erred in approving and adopting the Special Master's finding of fact No. 33 and in not sus-

taining plaintiffs' exception (No. 34) to the following statements in the Special Master's finding of fact No. 33:

(a) "That the Schmiedeknecht patent involves the fundamental structure of the Franquist patent No. 1,153,902 or of any trunk piston; and

(b) that it employs essentially the construction and arrangement of webs and mounting of wrist pin bosses of the Pugh British patent 17,256 of 1907 and the arrangement of the webs of the Ferry British patent No. 12,772 of 1914; and that the construction of the Schmiedeknecht patent differs from those of Pugh and Ferry patents and from a trunk piston in matters of design involving mere mechanical skill."

73. The Court erred in approving and adopting the Special Master's conclusion of law No. 38,

"That the Schmiedeknecht patent is invalid and void as to all claims in issue for want of invention over the prior art."

and in not sustaining plaintiffs' exception (No. 80) to the aforesaid conclusion of law No. 28.

GROUP J.

Assignment of errors relating to infringement of the Schmiedeknecht patent in suit.

74. The Court erred in failing to find and hold that defendant has infringed the Schmiedeknecht patent No. 1,256,265, particularly as to claims 1 and 3 thereof, and in failing to sustain plaintiffs' exceptions Nos. 53 and 110.

75. The Court erred in approving and adopting the Special Master's finding of fact No. 42,

"That defendants' piston, Ex. 1, does not embody the structure, function and mode of operation of the Schmiedeknecht patent in suit."

and in not sustaining plaintiffs' exception (No. 52) to the aforesaid finding of fact No. 42.

76. The Court erred in approving and adopting the Special Master's finding of fact No. 47, and in not sustaining plaintiffs' exception (No. 58) to the following statements and conclusions in the aforesaid finding of fact No. 47:

"* * * that in Ex. 1 each wrist pin boss is supported intermediate its ends on the web and not as described and claimed in the Schmiedeknecht patent."

77. The Court erred in approving and adopting the Special Master's conclusion of law No. 41,

"That defendant's piston, Ex. 1, does not infringe the Schmiedeknecht patent in suit."

and in not sustaining plaintiffs' exception (No. 93) to the aforesaid conclusion of law No. 41.

GROUP K.

GENERAL ASSIGNMENT OF ERRORS.

78. The Court erred in confirming the Report of the Special Master.

79. The Court erred in not granting plaintiffs the relief prayed for in the Bill of Complaint. (Plaintiffs' exceptions Nos. 95 and 111.)

80. The Court erred in dismissing the Bill of Complaint. (Plaintiffs' exception No. 96.)

81. The Court erred in assessing the costs of the suit against plaintiffs. (Plaintiffs' exceptions Nos. 97 and 111.)

Wherefore, plaintiffs pray that the said decree may be reversed and for such other and further relief as to the Court may seem just and proper.

WM. C. MCCOY,
F. O. RICHEY,
Solicitors for Plaintiffs,
The Cleveland Trust Company and
Chrysler Corporation.

Dated Oct. 17, 1934.

CITATION.

(Filed October 20, 1934.)

[Case No. 4045.]

UNITED STATES CIRCUIT COURT OF APPEALS
FOR THE SIXTH CIRCUIT.

To The Schriber-Schroth Company, Greeting:

You are hereby cited and admonished to be and appear at a session of the UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT, to be holden at the City of Cincinnati, in said Circuit, on the* 16th day of November next, pursuant to an appeal filed in the Clerk's office of the District Court of the United States for the Northern District of Ohio, wherein The Cleveland Trust Company, and the Chrysler Corporation, are appellants and you are appellee to show cause, if any there be, why the decree rendered against the said appellants as in the said petition for appeal mentioned, should not be corrected, and why speedy justice should not be done to the parties in that behalf.

WITNESS the Honorable Charles Evans Hughes, Chief Justice of the United States, this 17th day of October in the year of our Lord one thousand nine hundred and thirty-four and of the Independence of the United States of America the one hundred and fifty-ninth.

PAUL JONES,
Judge of the District Court.

*Not exceeding 30 days from day of signing.

Service of the above citation is hereby acknowledged and appearance of appellee is hereby entered.

KWIS, HUDSON & KENT,
JOHN H. BAUMINGA.

October 20, 1934.

BOND ON APPEAL.

(Filed October 23, 1934.)

[Case No. 4045.]

KNOW ALL MEN BY THESE PRESENTS, that we, The Cleveland Trust Company and Chrysler Corporation, bodies corporate, as principals, and American Surety Company of New York, 100 Broadway, New York City, a body corporate, as surety, are held and firmly bound unto The Schriber-Schroth Company, of Akron, Ohio, in the full and just sum of $500.00 to be paid to the said The Schriber-Schroth Company, its certain attorneys, successors, or assigns; to which payment well and truly to be made we bind ourselves and our successors, jointly and severally with these presents. Signed with our seals and dated this 22nd day of October, in the year of our Lord, One Thousand Nine Hundred and Thirty-four.

WHEREAS, lately at a session of the District Court of the United States for the Eastern Division of the Northern District of Ohio, in a suit pending in said Court between The Cleveland Trust Company, Chrysler Corporation, plaintiffs, and The Schriber-Schroth Company, defendant, a decree was entered against the said The Cleveland Trust Company and Chrysler Corporation, and the said plaintiffs have prosecuted an appeal in the United States Circuit Court of Appeals for the Sixth Circuit, to reverse the decree in the aforesaid suit, and a citation directed to the said The Schriber-Schroth Company, citing and admonishing it to be and appear at the United States Circuit Court of Appeals for the Sixth Circuit, at Cincinnati, Ohio, within 30 days from the date of such citation.

Now, the condition of the above obligation is such that if the said The Cleveland Trust Company and Chrysler Corporation shall prosecute said appeal to effect, and answer all damages and costs if they fail to make their appeal good, then the above obligation to be void, otherwise to remain in full force and effect,

THE CLEVELAND TRUST COMPANY.

By: R. A. MALM,

Vice President.

(APPROVED FOR EXECUTION BY THE C. T. Co.
EBF *Ass't Counsel.*)

CHRYSLER CORPORATION,
By: R. A. MALM,
Vice President, The Cleveland Trust Company.

(APPROVED FOR EXECUTION BY THE C. T. Co. EBF *Asst. Counsel.*)

(SEAL)

Sealed and delivered in the presence of:

A. J. PERFLER,
F. J. HAFFNER.

AMERICAN SURETY COMPANY OF NEW YORK,
By: EDW. F. ARCHER,
Resident Vice President. (Seal)

Attest:

R. V. MELLENBROOK,
Resident Assistant Sec'ty.

This bond is approved this 23rd day of October, 1934.

JONES,
U. S. District Judge.

ORDER GRANTING STIPULATION FOR FILING NARRATIVE FORM TESTIMONY IN ONE CAUSE WITH REFERENCE THERETO IN EACH OF OTHER TWO CAUSES.

(Entered October 26, 1934 by Paul Jones, Judge.)

[Case No. 4045.]

Pursuant to stipulation filed herein, it is ordered that the plaintiffs need not file separate narrative forms of the evidence in cases Nos. 4045, 4046 and 4047, but that it will be sufficient to file a narrative form in one cause and a reference thereto in each of the other two causes.

ORDER EXTENDING TIME FOR LODGING NARRATIVE STATEMENT OF EVIDENCE, FILING PRAECIPE AND FILING TRANSCRIPT OF RECORD IN U. S. CIRCUIT COURT OF APPEALS.

(Entered October 26, 1934 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praecipe in the Clerk's Office be and is hereby extended to and including November 24, 1934, and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including December 16, 1934.

JONES,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys consent to the above Order this 25th day of October, 1934.

EVANS & McCOY,
RICHEY & WATTS,
Attorneys for Plaintiff.

KNOX, HUNSAKER & KNOX,
Attorneys for Defendant.

ORDER EXTENDING TIME FOR LODGING NARRATIVE STATEMENT OF EVIDENCE, FILING PRAECIPE AND FILING TRANSCRIPT OF RECORD IN U. S. CIRCUIT COURT OF APPEALS.

(Entered November 22, 1934 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praecipe in the Clerk's Office be and it hereby is extended to and including December 14, 1934, and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including December 26, 1934.

JONES,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 20th day of November, 1934.

EVANS & McCOY,
Attorneys for Plaintiff.

KWIS, HUDSON & KENT,
Attorneys for Defendant.

STIPULATION EXTENDING TIME FOR FILING PRAECIPE AND LODGING NARRATIVE STATEMENT OF EVIDENCE.

(Filed December 13, 1934.)

[Case No. 4045.]

It is hereby stipulated by and between the parties, through their respective counsel, the Honorable Court consenting, that the time for filing the Praecipe and lodging the Narrative Statement in the above-entitled causes be extended to and including December 21, 1934.

EVANS & MCCOY,
Counsel for Appellants.

KWIS, HUDSON & KENT,
Counsel for Appellees.

It is so ordered.

JONES,
United States District Judge.

Cleveland, Ohio,
December 13th, 1934.

ORDER GRANTING STIPULATION EXTENDING TIME FOR FILING PRAECIPE AND LODGING NARRATIVE STATEMENT OF EVIDENCE.

(Entered December 13, 1934 by Paul Jones, Judge.)

[Case No. 4045.]

Pursuant to stipulation filed herein, it is ordered that the time for filing the praecipe and lodging the narrative statement in the above causes be extended to and including December 21, 1934.

ORDER EXTENDING TIME FOR LODGING NARRATIVE FORM OF TESTIMONY, FILING PRAECIPE AND FILING TRANSCRIPT OF RECORD IN U. S. CIRCUIT COURT OF APPEALS.

(Entered December 20, 1934 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praecipe in the Clerk's Office be and is hereby extended to and including December 31, 1934, and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including January 25th, 1935.

JONES,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 20th day of December, 1934.

EVANS & McCOY,
Attorneys for Plaintiffs.

KWIS, HUDSON & KNOX,
Attorneys for Defendant.

ORDER EXTENDING TIME FOR LODGING NARRATIVE FORM OF TESTIMONY AND FILING PRAECIPE.

(Entered January 2, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praecipe in the Clerk's Office be and is hereby extended to and including January 14, 1935.

JONES,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 31st day of December, 1934.

EVANS & McCOY,
Attorneys for Plaintiffs.

.....
Attorneys for Defendant.

WESTERN UNION

(54) 1934 Dec 31 AM 11 56

Received at 2040 East 9th St., Cleveland, Ohio
AB89 21 Collect—St Louis Mo 31 1014A

Evans & McCoy—
Bulkley Bldg Cleve—

Defendants in Cleveland Trust versus Aberdeen assent to extension of time for filing narrative and praecipe to January 14—

JOHN H. BRUNINGA.

(Received Dec 3 1934 Evans & McCoy.)

ORDER EXTENDING TIME FOR LODGING NARRATIVE FORM OF TESTIMONY, FILING PRAECIPE AND FILING TRANSCRIPT OF RECORD IN U. S. CIRCUIT COURT OF APPEALS.

(Entered January 14, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praecipe in the Clerk's Office be and is hereby extended to and including January 28, 1935; and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including February 23, 1935.

JONES,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 12th day of January, 1935.

WM. C. McCOY,
Attorney for Plaintiffs.

KWIS, HUDSON & KENT,
Attorneys for Defendant.

ORDER EXTENDING TIME FOR LODGING THE NARRATIVE FORM OF TESTIMONY AND FILING PRAECIPE.

(Entered January 23, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praecipe in the Clerk's Office be and is hereby extended to and including February 18, 1935.

JONES,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 22nd day of January, 1935.

EVANS AND McCOY,
Attorneys for Plaintiffs.

KWIS, HUDSON & KENT,
Attorneys for Defendant.

ORDER EXTENDING TIME FOR LODGING NARRATIVE FORM OF TESTIMONY, FILING PRAECIPE AND FILING TRANSCRIPT OF RECORD IN U. S. CIRCUIT COURT OF APPEALS.

(Entered February 18, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praecipe in the Clerk's office be and is hereby extended to and including February 25, 1935; and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including March 25, 1935.

JONES,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 18th day of February, 1935.

EVANS & McCOY,
Attorneys for Plaintiffs.

KWIS, HUDSON & KENT,
Attorneys for Defendant.

ORDER EXTENDING TIME FOR FILING PRAECIPE.

(Entered February 26, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for filing the Praecipe in the Clerk's Office be and is hereby extended to and including March 15, 1935.

JONES,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 25th day of February, 1935.

EVANS & MCCOY,
Attorneys for Plaintiffs.

KWIS, HUDSON & KENT,
Attorneys for Defendant.

ORDER EXTENDING TIME FOR FILING PRAECIPE AND FOR FILING TRANSCRIPT OF RECORD IN U. S. CIRCUIT COURT OF APPEALS.

(Entered March 15, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for filing the Praecipe in the Clerk's office be and is hereby extended to and including April 15, 1935; and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including April 25, 1935.

S. H. WEST,
United States District Judge.
In absence of Judge Jones from dist.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 15th day of March, 1935.

EVANS & MCCOY,
Attorneys for Plaintiffs.

KWIS, HUDSON & KENT,
Attorneys for Defendants.

ORDER EXTENDING TIME FOR FILING PRAECIPE AND FOR FILING TRANSCRIPT OF RECORD IN U. S. CIRCUIT COURT OF APPEALS.

(Entered April 16, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for filing the Praecipe in the Clerk's office be and is hereby extended to and including May 6, 1935; and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including May 16, 1935.

JONES,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 15th day of April, 1935.

EVANS & McCOY,
Attorneys for Plaintiffs.

KWIS, HUDSON & KENT,
Attorneys for Defendants.

ORDER EXTENDING TIME FOR FILING TRANSCRIPT OF RECORD IN U. S. CIRCUIT COURT OF APPEALS.

(Entered May 14, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including June 15th, 1935.

JONES,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 13th day of May, 1935.

EVANS & McCOY,
Attorneys for Plaintiff.

KWIS, HUDSON & KENT,
Attorneys for Defendant.

ORDER EXTENDING TIME FOR FILING TRANSCRIPT OF RECORD IN UNITED STATES CIRCUIT COURT OF APPEALS.

(Entered June 12, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including August 15th, 1935.

JONES,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 12th day of June, 1935.

EVANS & McCOY,
Attorneys for Plaintiff.

KWIS, HUDSON & KENT,
Attorneys for Defendants.

ORDER EXTENDING TIME FOR FILING TRANSCRIPT OF RECORD IN UNITED STATES CIRCUIT COURT OF APPEALS.

(Entered July 11, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including August 31st, 1935.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 10th day of July, 1935.

EVANS & McCOY,
Attorneys for Plaintiffs.

KWIS, HUDSON & KENT,
Attorneys for Defendants.

ORDER EXTENDING TIME FOR FILING TRANSCRIPT OF RECORD IN UNITED STATES CIRCUIT COURT OF APPEALS.

(Entered August 19, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including September 30th, 1935.

JONES,
United States District Judge.

Subject to the consent of the Court the parties hereto, by their attorneys, consent to the above Order this 15th day of August, 1935.

EVANS AND McCOY,
Attorneys for Plaintiffs.

KWIS, HUDSON & KENT,
Attorneys for Defendant.

STIPULATION THAT APPEALS IN CAUSES NOS. 4045, 4046 AND 4047 BE CONSOLIDATED IN ONE PRINTED TRANSCRIPT OF RECORD, THAT EXHIBITS USED THEREIN MAY BE USED IN EACH OF SAID CAUSES AND THAT REPETITION OF SIMILAR PLEADINGS IN EACH BE ELIMINATED.

(Filed March 2, 1935.)

[Case No. 4045.]

It is hereby stipulated by and between the respective parties to the above entitled causes, by their counsel, as follows:

That on the appeals of the above causes the record is to be consolidated in one printed transcript of record and that the exhibits referred to therein may be used in each of said causes.

That where pleadings or other papers appear in substantially the same form in more than one case it will be sufficient to print such papers in the transcript only in one case with suitable references thereto in the other cases, reprinting in such other cases only those portions of the papers which differ from those of the first case.

EVANS AND McCOY,
Counsel for Appellant.

KERR, HUDSON & KNUT,
Counsel for Appellee.

It is so ordered.

S. H. WEST,
U. S. District Judge.

ORDER CONSOLIDATING APPEALS IN ONE PRINTED TRANSCRIPT OF RECORD THAT EXHIBITS USED THEREIN MAY BE USED IN EACH OF SAID CAUSES, AND FURTHER ORDERING ELIMINATION OF REPETITION OF SIMILAR PLEADINGS IN EACH CAUSE.

(Entered March 2, 1925 by Paul Jones, Judge.)

[Case No. 4965.]

Pursuant to stipulation filed herein, it is ordered that on the appeals of the above causes the record is to be consolidated in one printed transcript of record and that the exhibits referred to therein may be used in each of said causes.

It is further ordered that where pleadings or other papers appear in substantially the same form in more than one case it will be sufficient to print such papers in the transcript only in one case with suitable references thereto in the other cases, reprinting in such other cases only those portions of the papers which differ from those of the first case.

STIPULATION RE DIGEST OF EXHIBITS.

(Filed May 4, 1925.)

[Case No. 4965.]

It is hereby stipulated and agreed by and between counsel for the parties hereto, this Honorable Court consenting, that plaintiff's documentary exhibits as follows:

2A, 2B, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 4D, 5A, 5B, 5C and 5D, and defendant's documentary exhibits as follows:

X, AA, 4-E, 5-F1 to 5-F12, inclusive, 5-G, 5-H1, 5-H2, 5-H3 and 5-I, be incorporated and printed for the record

on appeal in digest form and that the attached digests of said exhibits be substituted in the printed record for the originals of each of the aforesaid.

It is further stipulated and agreed that each of the aforesaid original exhibits, plaintiffs' exhibits 2A, 2B, 2C, 2D, 4A, 4B, 4C, 4D, 5A, 5B, 5C and 5D, and defendant's exhibits 1, 4A, 4B, 5-F1 to 5-F16, inclusive, 5-G, 5-H1, 5-H2, 5-H3 and 6-I to material among those exhibits withdrawn to be forwarded to the Clerk of the Circuit Court of Appeals for the Sixth Circuit for the hearing on appeal in accordance with the stipulation on that matter.

Dated: April 6, 1935

Evans & McCoy,
Solicitors for Plaintiffs.

Dated: May 1, 1935

James H. Bowman,
Counsel for Defendant.

It is so ordered.

Jones,
U. S. District Judge.

[illegible]

[illegible]

(Entered May 4, 1935 by Paul Jones, Judge.)

[Cause No. 6945.]

Pursuant to stipulation filed herein, it is ordered that plaintiffs' documentary exhibits as follows:

2A, 2B, 2A, 2B, 3C, 3D, 4A, 4B, 4C, 4D, 5A, 5B, 5C and 5D, and defendant's documentary exhibits as follows:

[redacted] and 3-12, be transmitted and printed for the record on appeal to the Circuit Court and that the omitted designation of said exhibits be supplemented to the printed record for the support of each of the aforesaid.

It is further ordered that each of the aforesaid original exhibits, plaintiff's exhibits 1-A, 2-B, 3-C, 4-D, 5-E, 6-F, 7-G, 8-H, 9-I, 10-J, 11-K, 12-L, and 13-M, and defendant's exhibits [redacted] and 3-12 be marked among those exhibits withdrawn to be forwarded to the Clerk of the Circuit Court of Appeals for the Ninth Circuit for the hearing on appeal in accordance with the stipulation on that matter.

[redacted]

(Filed May 6, 1935.)

[Cause No. 6935.]

1. Original Bill of Complaint.
2. Defendant's Motion for further and better statement and bill of particulars.
3. Ruling of Court on motion for particulars.
4. Plaintiff's Bill of Particulars.
5. Petition of John H. Dunlap for leave to enter special appearance of Sterling Products Corporation, to object to the jurisdiction.
6. Ruling on Petition objecting to jurisdiction.
7. Defendant's Answer.
8. Defendant's Notice of taking depositions.
9. Defendant's Supplemental Notice of taking depositions.
10. Order for reference to and appointment of Special Master.

11. Stipulation consolidating Equity causes 6045, 6046 and 6047 for trial, etc.
12. Defendant's Amendment to Answer.
13. Report of Wm. H. Wade, Special Master.
14. Plaintiffs' Exceptions to Report of Special Master.
15. Court's Memorandum on Plaintiffs' Exceptions to the Master's Report.
16. Final Decree.
17. Petition for Appeal.
18. Assignments of Errors.
19. Order Allowing Appeal.
20. Citation.
21. Stipulation re Narrative of Transcript.
22. Narrative of transcript of testimony.
23. Order approving narrative.
24. Stipulation and order consolidating Record on Appeal.
25. Stipulation re Certification of Record.
26. Appeal Bond.
27. This Praecipe.
28. Clerk's Certificate.
29. Further Orders and documents as may be filed or entered subsequent to the date hereof and pertaining to this Appeal.

30. The following exhibits, or the stipulated digests of exhibits, or the specified portions thereof, are to be printed in the transcript of testimony:

PLAINTIFFS' EXHIBITS:

2, 3, 4, 5 and 6;

Stipulated digest of 1A, 1B, 1A, 2B, 2C, 2D, 4A, 4B, 4C, 4D, 5A, 5B, 5C and 5D;

7, 11, 13, 15, 16, 21, 22, 25, 26, 28, 29, 31, 32, 35A to 35E inclusive, 36, 37;

38 (including 38a to 38e inclusive)—This exhibit was also offered as Defendants' Exhibits 4S and 4T;

39 (including 39a to 39g inclusive)—This exhibit was also offered as Defendants' Exhibit 4U;

40—This exhibit was also offered as Defendants' Exhibit 4V;

42A—Omit last 12 lines;

42B—Omit from line 2 to line 55, beginning "Time for Week" and ending "one small crack in web" on first sheet;

Omit last 34 lines on second sheet;

62C—Omit first four paragraphs under "*M L 4X 10000 Mile Wear Test.*";

Omit last 12 lines of first page;

Omit first 10 lines of second page;

44, 45, 46A, 46B, 46, 50, 51, 52, 53, 54, 55, 56, 57, 60, 62—(This exhibit identified before offer as Exhibit 33), 63, 64, 65, 66, 67B, 67C, 67D, 69A, 69B, 69C, 69A, 69B, 69C, 70A, 70B, 74, 75, 84 and 85.

DEFENDANTS' EXHIBITS:

A;

C—Two paragraphs entitled "Long Type Pistons";

D—The seven paragraphs under "New Design for Series Nine";

H—Article entitled "The Oval Type Piston";

I—Page 1 and the drawing on page 2 entitled "Drill Jig for Holes Oil Holes in Piston";

J, K, L, M;

N—Page 8, article entitled "Piston Slap" and first 29 lines of page 9;

O, S, T-1, T-2, T-3;

U—M. K. Wesson advertisement;

W;

X—Stipulated Digest; (See stipulation)

Y, Z;

AA—Stipulated Digest; (See stipulation)

CC, DD, EE, FF, GG, HH, II, JJ, KK, LL, MM;

3-S—Page 274 to matter entitled "Correspondence" on page 280;

3-X, 4-A, 4-B, 4-C, 4-D, 4-E, 4-F;

4-G—Page 362 to matter entitled "S. S. C. O. Steering Gear Lock" on page 364;

4-H, 4-I;

4-J—Page 602 to matter entitled "Standardization of Insulating Materials Begun in Germany" on page 604;

4-K—Page 562 to end of line 13 of first column on page 560;

4-L, 4-L$_1$, 4-L$_2$, 4-L$_3$, 4-L$_4$;

4-M—Article entitled "Herschell-Spillman Cross Head Piston," including drawing entitled "The Cross Head Piston";

4-N—Page 1061, the paragraph beginning "The pistons are of original design . . . ," first column, line 22, and ending first column, line 36, including the drawing entitled "Cross Section of Premier Motor Head Construction";

4-O—Page 85, beginning line 11 of the second column to end of line 9, first column, page 86, and the drawing on page 86 entitled "The Premier-Weidely Piston";

4-P, 4-Q;

4-R—Stipulated Digest; (See stipulation)

4-X, 4-Y, 4-Z, 5-C, 5D;

5-E—From line 14, first column, beginning "Fig. 2. To prevent piston slap, preferably in," to end of line 4 of the second column, including the drawing, Fig. 2;

5-F_1 to 5-F_{11} inclusive—Stipulated Digest; (See stipulation)

5-G—Stipulated Digest; (See stipulation)

5-H_1, 5-H_2 and 5-H_3—Stipulated Digest; (See stipulation)

5-I—Stipulated Digest; (See stipulation)

Bill of Complaint in The Cleveland Trust Company v. The Simmons Manufacturing Company, In Equity No. 3510;

5-J, 5-K_1, 5-K_2, 5-K_3, 5-K_4, 5-K_5, 5-K_6, 5-K_7, 5-K_8, 5-K_9, 5-K_{11}, 5-K_{12}, and 5-M;

31. Order for withdrawal of exhibits.

EVANS & McCOY,
Counsel for Plaintiffs-Appellants.

Service of a copy acknowledged this 4th day of May, 1935.

KWIS, HUDSON & KENT,
Counsel for Defendants-Appellees.

STIPULATION RE CERTIFICATION OF RECORD.

(Filed May 6, 1935.)

[Case No. 4045.]

In accordance with Section 6 of Rule 44 of the general rules of this Court, it is hereby agreed that the record as presented to the Clerk by the printer, may be certified by the Clerk as required by law and the rules of the Appellate Court, as a true, full and complete copy of the original pleadings, papers and orders used on the trial of this cause, as set forth in the precipe for transcript, without further comparison by the Clerk.

EVANS & McCOY,
Attorneys for Plaintiffs.

KWAN, HUDSON & KNOX,
Attorneys for Defendant.

DEFENDANTS' MOTION FOR LEAVE TO ADD TO THE RECORD IN THE ABOVE-ENTITLED CAUSE DEFENDANTS' COUNTER PRAECIPE AND CERTAIN LETTERS.

(Filed May 14, 1935.)

[Case No. 4045.]

Now come defendants in the above-entitled causes and respectfully petition this Court for leave to enter in the appeal record in the above-entitled causes, Defendants' Counter Praecipe, filed herewith, and letters noted in the praecipe, and copies of which are attached to the praecipe. These letters are the following:

1. Letter of Wm. B. Woods, Special Master, dated December 30, 1933, and addressed to counsel for the respective parties, reading as follows:

"In Re: The Cleveland Trust Co., Chrysler Corporation, Plaintiffs, vs. The Schriber-Schroth Co., vs. The Aberdeen Motor Supply Co., vs. The F. E. Rowe Sales Co., Defendants.

Gentlemen:

Herewith I hand you draft copy of my report as Special Master in this suit.

"If there are errors or corrections to which you would call attention, the Master will consider and make corrections insofar as he believes proper and in keeping with his views as expressed in the report. I would be obliged if I could hear from you not later than January 15th, 1934, after which time I hope to have the report in final form for filing.

"In making such suggestions, I would also be obliged if you would return your draft copy so that any changes can be made therein and it will be returned to you as the report is filed.

Yours very truly,

Wm. B. Woods (signed)
Special Master."

To this letter defendants' counsel replied by making suggestions, many of which were adopted by the Master.

2. To this letter of the Master, plaintiff's counsel, however, replied as follows:

"In Re: The Cleveland Trust Co., Chrysler Corporation, Plaintiffs, vs. The Schriber-Schroth Co., vs. The Aberdeen Motor Supply Co., vs. The F. E. Rowe Sales Co., Defendants.

"We received the copy of your draft report in the above entitled causes and we do not believe that there are any errors or corrections in this report to which we might call your attention which would be in keeping with the views which you have expressed in your report.

"If you change any of the pages before you file the report, would you please send us copies of the amended pages that we may substitute them in the copies of the report which you sent us? Will you also advise us when the report is filed?

"We are sending a copy of this letter to Mr. Bruninga.

"Thanking you for your courtesies in the premises, we remain

Very truly yours,

F. O. Richey (signed)
Wm. C. McCoy (signed)"

The above letter was written by the Special Master in pursuance to his duties as Special Master and was replied to by plaintiff's counsel in the same way and should, therefore, be a part of the record in this cause for the following reasons:

I. The Master's letter submitted a draft report and it was the duty of counsel to file objections or exceptions to this draft report, at least in the form of suggestions or corrections. As was said by Judge Ray in *Decker v. Smith*, 225 Fed. 776 (N. D. Y. N.) l.c. 777:

> "The object of filing objections with the master to his draft or proposed report is to give him an opportunity to correct his report, reconsider any point objected to, and decide differently if he on reconsideration deems himself in error."

This view was affirmed by the Circuit Court of Appeals for the Eighth Circuit in *American Surety Co. v. Dick*, 23 F. (2d) 464, 467.

In view of the failure of plaintiff to file exceptions to the draft report there is a question of whether plaintiff has any standing; and, although this Court did not rule upon that question, the Court of Appeals can at least give the situation consideration, particularly in view of plaintiff's 111 exceptions before this Court, and in view of what here follows:

II. Throughout the briefs before this Court plaintiff's counsel attacked the Master's Report in a manner not merely to show that the Master had committed errors of law or that his findings were not supported by the evidence, but the briefs went further, even to the extent of taking advantage of typographical errors; an example of the latter is Plaintiff's Reply Brief (pp. 21-22) as follows:

> "The pother about Claim 10 of *the* Long patent is unnecessary and immaterial. That claim is not in the Gulick patent. The Master, at page 85,

erroneously said that Claim 27 of Gulick was the same as Claim 10 of Long, and at page 104 of his report erroneously said that Claim 13 of Gulick was the same as Claim 10 of Long. Claim 10 of Long does not appear in the Gulick patent at all. It does not, therefore, matter that this claim reads 'word for word' upon any of the prior art, if it does. None of the Gulick claims read word for word on the prior art and even if they did, there would be no anticipation or no invalidating of the claims unless there was identity or substantial identity of operation and result."

Another example, but more mild, is found in Plaintiff's Brief (p. 3) as follows:

"It is no exaggeration, we think, to say that the learned Master has reported contrary to every one of these Patent Office Tribunals and Courts on substantially every ruling that any one of them has made during the prosecution of the applications for which, and the interferences after which the patents in suit issued."

In view of the attack by plaintiff's counsel, even in the first brief, we called the attention of this Court to the situation as noted above in Defendants' Brief (pp. 4-5), but still thereafter plaintiff's counsel insisted in the Reply Brief in even relying upon typographical errors, as noted above.

We believe, therefore, that in order to forestall the same situation before the Court of Appeals, it is entirely proper to include in the record before the Court of Appeals the actual situation as it existed, namely, that there were no exceptions to the Master's draft Report filed by plaintiff's counsel, nor even corrections and suggestions submitted to the Master by plaintiff's counsel, but that they, in fact, informed the Master that they had none. If these letters are not in the official files as returned by the Master, they can very readily be placed in those files as the Master has them undoubtedly in his possession.

Respectfully submitted,

JOHN H. BRUNNER,
Counsel for Defendants.

St. Louis, Missouri,
May 13, 1935.

Service and receipt of copy of the above Motion acknowledged, this 14th day of May, 1935.

EVANS & McCOY,
Counsel for Plaintiff.

Motion denied.

JONES,
Judge.

May 15, 1935.

ORDER DENYING MOTION OF DEFENDANTS FOR LEAVE TO ADD TO RECORD DEFENDANTS' COUNTER PRAECIPE AND CERTAIN LETTERS.

(Entered May 15, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

This day these causes came on to be heard on the motion of the defendants for leave to add to the record herein the defendants' counter praecipe and certain letters, and were submitted to the Court; on consideration thereof the Court denied said motion.

PETITION TO SUPPLY LAST EIGHT PAGES MISSING FROM PLAINTIFFS' EXHIBIT 13 IN THE ABOVE CAUSE ON APPEAL.

(Filed June 18, 1935.)

[Case No. 4045.]

Now come the Plaintiffs and petition the Honorable Court for leave to supply certain pages missing from Plaintiffs' Exhibit 13 to the printer for use in preparing the Record for the Court of Appeals in the foregoing cause.

EVANS & McCOY,
Attorneys for Plaintiffs.

Service and a copy of the foregoing Petition acknowledged this 17 day of June, 1935.

KWIS, HUDSON & KENT,
Attorneys for Defendants.

Mailed with exceptions to defendants.

JONES,
Judge.

June 18, 1935.

ORDER GRANTING LEAVE TO SUPPLY LAST EIGHT PAGES OF PLAINTIFFS' EXHIBIT NO. 13.

(Entered June 18, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

This day these causes came on to be heard on the petition of the plaintiffs for leave to supply the last eight pages missing from Plaintiffs' Exhibit 13 to the printer for use in preparing the record for the Court of Appeals herein, and were submitted to the Court; on consideration thereof the Court granted said petition, to which ruling of the Court the defendants by their attorneys, except.

DEFENDANTS' COUNTER PRAECIPE.

(Filed June 27, 1935.)

[Case No. 4045.]

To the Clerk of the Above-entitled Court:

In addition to the items called for in the Praecipe filed by plaintiff in the above-entitled case, you will please incorporate in the transcript of record for the Court of Appeals for the Sixth Circuit, the following:

A. Petition to supply the last eight pages missing from Plaintiff's Exhibit 13 and Order granting the same but allowing exceptions to defendant—dated June 18, 1935.

B. Letter of Wm. B. Woods, Special Master, dated December 30, 1933, and addressed to counsel for the respective parties.

C. Letter dated January 13, 1934, addressed to Wm. B. Woods, Special Master and signed F. O. Richey and Wm. C. McCoy.

D. Defendants' Motion for leave to add to the record in the above entitled cause the defendants' Counter Praecipe and certain letters and Order denying the same.

JOHN H. BRUNINGA,
Attorney for Defendants.

St. Louis, Mo.
June 19, 1935.

ORDER SETTLING CONTENTS OF RECORD.

(Entered July 6, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

On objection of Plaintiffs to items B and C of Defendants' counter praecipe filed June 27, 1935, it is ordered that items B and C of Defendants' counter praecipe filed June 27, 1935, be omitted from the transcript of record. Exception to Defendants.

On objection of Plaintiffs to item D of Defendants' counter praecipe filed June 27, 1935, it is ordered that the transcript of record shall contain item D of Defendants' counter praecipe filed June 27, 1935. Exception to Plaintiffs.

It is further ordered that the transcript of record shall contain item A of Defendants' counter praecipe filed June 27, 1935 and the following additional papers:

Defendants' counter praecipe filed June 27, 1935.
This order.

JONES,
U. S. District Judge.

Approved:

EVANS & McCOY,
Attorneys for Plaintiffs.

KWIS, HUDSON & KENT,
Attorneys for Defendants.

ORDER FOR WITHDRAWAL OF EXHIBITS.

(Entered September 4, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It having been represented to the Court by the parties herein that plaintiffs' Exhibits 1, 1Z, 2Z, 2A, 2B, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 4D, 5A, 5B, 5C, 5D, 8, 9, 10-A, 12, 14, 17, 20, 23, 24, 30, 34, 42A, 42B, 42C, 43, 47, 48, 49, 58, 59, 61, 71-A, 71-B, 72-A, 72-B, 73, 76, 79, 80, 81, 82, 83, and

Defendants' Exhibits A, B, E, F, G, O, P, P-1, P-2, Q, R, V_1 to V_7 inclusive, W, X, Y, AA, GG-1, HH-1, II-1, II-2, JJ-1, NN, AAA, BBB, CCC, EEE, FFF, 3-G, 3-H, 3-I, 3-J, 3-K, 3-L, 3-M, 3-N, 3-O, 3-P, 3-Q, 3-R, 3-T, 3-V, 3-W, 4-R, 5-F_1 to 5-F_{12} inclusive, 5-G, 5-H_1, 5-H_2, 5-H_3, 5-I, 5-K_{10}, 5-L, filed in this cause, are physical exhibits or otherwise cannot be conveniently duplicated or are needed for inspection as physical exhibits in the United States Court of Appeals for the Sixth Circuit, it is hereby ORDERED that the said Exhibits be withdrawn from the

files of this Court and transmitted under the supervision of the Clerk of this Court to the Clerk of the United States Court of Appeals for the Sixth Circuit at Cincinnati, Ohio, and the Clerk of this Court is hereby directed to withdraw the same from the files and supervise the packing and transmitting thereof to the Court of Appeals.

JONES,
United States District Judge.

Consented to:

WM. C. McCOY,
Counsel for Plaintiffs.

JOHN H. BRUNINGA,
Counsel for Defendants.

STIPULATION RE CERTIFICATION OF RECORD.

(Filed May 6, 1935.)

[Case No. 4045.]

In accordance with Section 6 of Rule 44 of the general rules of this Court, it is hereby agreed that the record as presented to the Clerk by the printer, may be certified by the Clerk as required by law and the rules of the Appellate Court, as a true, full and complete copy of the original pleadings, papers and orders used on the trial of this cause, as set forth in the precipe for transcript, without further comparison by the Clerk.

EVANS & McCOY,
Counsel for Plaintiffs.

KWIS, HUDSON & KENT,
Counsel for Defendants.

Vol. III

TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1938

No. 3

THE SCHRIBER-SCHROTH COMPANY,
PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 4

THE ABERDEEN MOTOR SUPPLY COMPANY,
PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 5

THE F. E. ROWE SALES COMPANY, PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

ON WRITS OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT.

United States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants,* vs. THE SCHRIBER-SCHROTH COMPANY, *Defendant-Appellee.*	No. 4045. EQUITY.
THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants,* vs. THE ABERDEEN MOTOR SUPPLY COMPANY, *Defendant-Appellee.*	No. 4046. EQUITY.
THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants,* vs. THE F. E. ROWE SALES COMPANY, *Defendant-Appellee.*	No. 4047. EQUITY.

APPEALS FROM
THE DISTRICT COURT OF THE UNITED STATES,
FOR THE NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION.

TRANSCRIPT OF RECORD
VOLUME III.
Plaintiffs' Exhibits and Part of Defendants' Exhibits.

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JOHN H. BRUNINGA,
Railway Exchange Bldg., St. Louis, Missouri,

KWIS, HUDSON & KENT,
Union Trust Bldg., Cleveland, Ohio,
Attorneys for Defendants-Appellees

United States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,
vs.
THE SCHRIBER-SCHROTH COMPANY,
Defendant-Appellee.
No. 4045.
EQUITY.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,
vs.
THE ABERDEEN MOTOR SUPPLY COMPANY,
Defendant-Appellee.
No. 4046.
EQUITY.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,
vs.
THE F. E. ROWE SALES COMPANY,
Defendant-Appellee.
No. 4047.
EQUITY.

APPEALS FROM
THE DISTRICT COURT OF THE UNITED STATES,
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EASTERN DIVISION.

TRANSCRIPT OF RECORD
VOLUME III.
Plaintiffs' Exhibits and Part of Defendants' Exhibits.

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4.	U. S. Patent No. 1,655,968, Jan. 10, 1928, to H. E. Maynard (Patent in Suit)	51	1299
5.	U. S. Patent No. 1,256,265, Feb. 12, 1918, to V. E. Schmiedeknecht (Patent in Suit)	51	1305
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* In the case of Exhibits which were formally offered on pages of the Original Transcript not included in the Narrative, reference to them is made by the use of the words as "Discussed," "Identified" or "Marked for Identification" in parenthetical brackets instead of by the use of figures in the "Offered" Column of this Index.

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DEFENDANTS' EXHIBITS.

(*W* in last column signifies *Withdrawn or Omitted*)

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W.	Photostat of Trunk Piston added to by Chadwick to show T-Slot, Long Piston	396	1623
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3-U.	Letter, McCoy to J. King Harness, Dec. 30, 1932	590	W
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4-H.	Prior Art Patents	539, 591	...

U. S. PATENTS:

No. 700,309	May 20, 1902	H. E. Ebbs	1671
No. 908,569	Jan. 5, 1909	F. D. Howe	1675
No. 1,031,212	Jul. 2, 1912	E. Van Bever	1679
No. 1,092,870	Apr. 14, 1914	E. O. Spillman and L. P. Mooers	1683
No. 1,153,902	Sept. 21, 1915	G. E. Franquist	1687
No. 1,174,092	Mar. 7, 1916	W. L. Schoengarth	1693
No. 1,195,936	Aug. 22, 1916	C. White	1699

* Exhibit 3-Z is erroneously referred to in the Narrative, at page 472, as Exhibit 3-Y.

No. 1,229,540	June 12, 1917	E. O. Spillman	1703
No. 1,279,184	Sept. 17, 1918	J. G. Vincent	1707
No. 1,283,021	Oct. 29, 1918	C. C. Anderson	1713
No. 1,294,833	Feb. 18, 1919	H. R. Ricardo	1717
No. 1,325,176	Dec. 16, 1919	A. Spillman	1723
No. 1,395,441	Nov. 1, 1921	E. C. Long	1727
No. 1,489,499	Apr. 8, 1924	E. C. Long	1731
No. 1,872,772	Aug. 23, 1932	E. C. Long	1735

British Patents:

No. 19,559 of 1890	James Roots	1739
No. 17,256 of 1907	John Vernon Pugh	1743
No. 6,826 of 1912	William Frederick Rainforth	1751
No. 12,772 of 1914	Samuel Octavius Ferry	1755
Specification 140,988	Ernest Walter Hives	1759

French Patents:

No. 468,595 of 1914	Chenard and Walcker	1763
	(Translation of foregoing)	1767
No. 434,147 of 1911	M. Chas.-Emile Serex	1769
	(Translation of foregoing)	1773
No. 16,362 of 1912	M. Chas.-Emile Serex	1777
	(Translation of foregoing)	1781

German Patent:

No. 176,988 of 1906	Otto Lietzenmayer	1785

Additional U. S. Patents:

No. 1,557,625	Oct. 20, 1925	L. M. Stellmann	1789
No. 1,842,022	Jan. 19, 1932	S. D. Hartog	1797
No. 1,499,073	June 24, 1924	L. H. Pomeroy	1803

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	Bill of Complaint in Case No. 3510 in the U. S. District Court for the Northern District of Ohio, The Cleveland Trust Co. and Chrysler Corp. vs. The Simmons Mfg. Co. and Sterling Products Corp....	...	2285
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5-K_5.	Letter dated May 22, 1915 from W. L. Schoengarth to Louis Bagger & Co.....	899	2311
5-K_6.	Letter dated May 27, 1915 from Louis Bagger & Co. to W. L. Schoengarth.....	899	2311
5-K_7.	Letter dated July 29, 1914 from W. L. Schoengarth to Louis Bagger & Co.	899	2312
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CASE NO. 4046.

Caption 2331

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Caption 2343

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Certificate of Clerk 2357

Proceedings in U. S. C. C. A. Sixth Circuit 2379

Minute entry of argument and submission 2379

Decree, No. 7223 2379

Decree, No. 7224 2379

Decree, No. 7225 2380

Opinion, Simons, J. 2381

PLAINTIFFS' EXHIBIT NO. 2.
Gulick Patent in Suit.
U. S. Patent No. 1,815,733, July 21, 1931,
To H. J. Gulick.
Piston.
(Filed January 27, 1934.)

1284

July 21, 1931. E. J. GULICK 1,815,733

PISTON

Filed Nov. 30, 1917

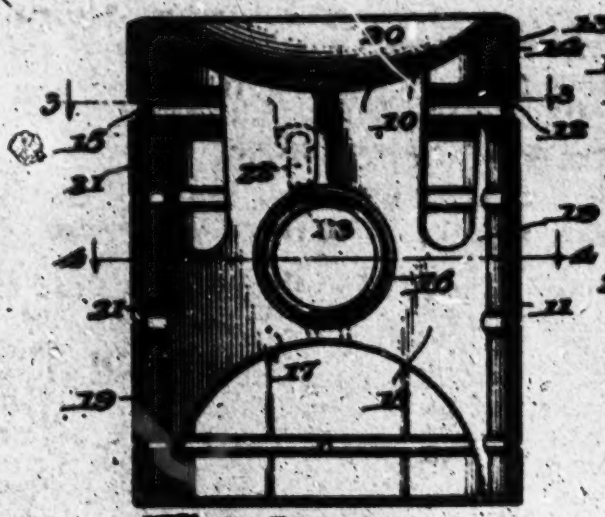

Fig. 1.

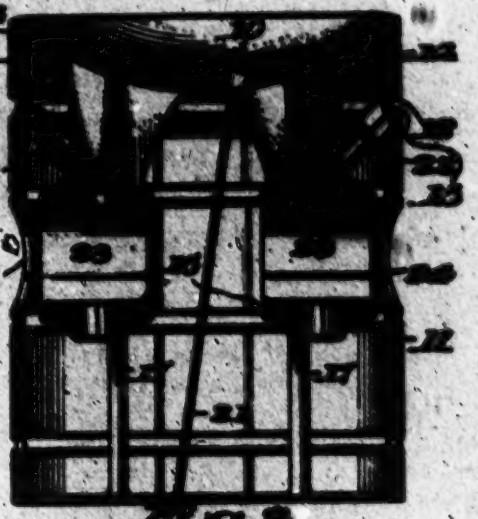

Fig. 2.

Fig. 3.

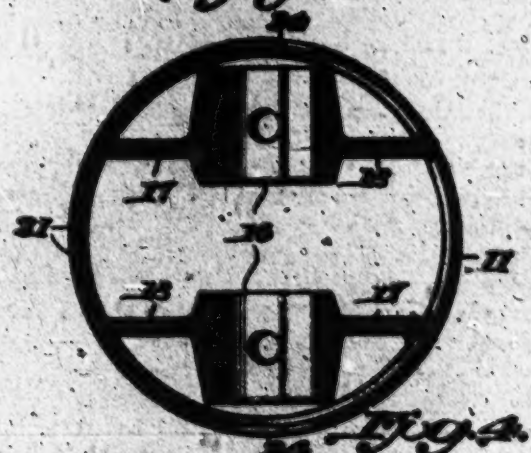

Fig. 4.

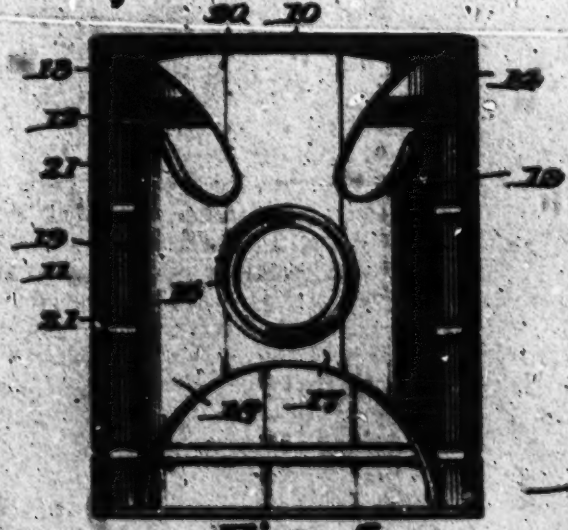

Fig. 5.

Fig. 6.

Inventor:
Edward J. Gulick,
by Wilkinson & Howson
Attys.

UNITED STATES PATENT OFFICE

EDWARD J. GULICK, OF WHEELER, INDIANA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE OLMSTEAD MOTOR COMPANY, A CORPORATION OF OHIO

PISTON

Application filed December 18, 1922. Serial No. 607,431.

This invention relates to pistons.

One of the objects of the present invention is to provide a piston which will not expand against the cylinder wall to such an extent as to seize or stick.

Another object of the invention is to provide a piston with a skirt or guide portion slightly separated from the body of the piston and split longitudinally so that it will not expand in circumference with a force great enough to cause the piston to stick in the cylinder.

Another object of the invention is to provide a piston with improved packing means for the piston pin bosses.

Another object of the invention is to support the piston pin bosses of a piston from the piston wall without individual bolts thereto from the connecting rod without interfering with the guiding characteristics of the skirt in response to cylinder wall pressure.

Other objects of the invention will appear from the following description, taken in connection with the accompanying drawings, forming a part of this specification, and in which:

Fig. 1 is a longitudinal sectional view through a piston embodying the invention;

Fig. 2 is similar to Fig. 1, but on a right angle thereto, being on the line 2—2 of Fig. 3;

Fig. 3 is a transverse section substantially on the line 3—3 of Fig. 1;

Fig. 4 is a transverse section on the line 4—4 of Fig. 1;

Fig. 5 is a view similar to Fig. 1, showing a slightly different form of piston embodying the invention; and

Fig. 6 is a top view of the piston shown in Fig. 5.

Referring to the drawings, 10 designates the head portion of a piston and 11 is a skirt or guide portion which is spaced at a distance from the head portion to provide an annular slot or opening 12 therebetween. The head portion of the piston is provided with an annular groove 13 which receives a piston ring 14, and the upper end of the skirt portion 11 is formed with a similar groove 15 for the reception of an annular piston ring 16. The skirt portion 11 is split longitudinally as at 17 and is provided with a plurality of openings 18 which communicate with the annular groove 15 and with the slot 12 for the purpose of collecting the oil that may be scraped from the cylinder during the reciprocation of the piston.

The piston is also provided with a pair of spaced bosses, pin bores 19 which are formed with integral supporting flanges 20 extending around the bores and terminating in the inner wall of the skirt portion 11. These flanges 20 are preferably of the same thickness as the wall of the skirt portion 11 and in the form of webs 21 which integrally connect the bosses 19 with the wall of the guide portion 11 as shown in the drawings. Since there are two of these webs extending from the wall of the bosses 19 there are therefore four openings 22 between the webs 21 in the skirt or guide portion 11. These openings are in the form of segments of circles as shown.

The flanges 20 are connected together by the bosses 19 by the webs 21 and by the wall of the skirt portion 11 and thereby eliminate the necessity of the bolts and fastening elements by which the bosses are usually connected to the connecting rod. The bosses are connected with the head portion of the piston by the webs 21 which are integral with the head portion and the bosses 19 and are shown in Fig. 1 as being of substantially the same thickness as the flanges 20 and the skirt portion 11.

In order that the oil may be scraped from the cylinder wall by the piston it is necessary that the piston be provided with a plurality of openings through which the oil may pass. In the present instance the openings 18 are provided for this purpose and are shown as being in the form of slots which are arranged in pairs, one pair being disposed between each pair of bosses as shown in Figs. 1 and 6.

In order that the oil may be returned to the crank case through the piston it is necessary that the piston be provided with openings through which the oil may pass. In the present instance the openings 22 are provided for this purpose and are shown as being in the form of segments of circles as shown in Figs. 1 and 6.

may be inserted. As these openings are well above the bottom of the guide portion of the piston the lower end of the piston skirt is left unbroken, except for the split 21, and the arcuate parts of the skirt beneath said openings may be looked upon as joining the lower ends of the diametrically opposite cylinder-engaging parts of the guide that sustain the angular thrust of the connecting rod.

It will be seen that in addition to providing a piston with a split guide portion, the above described construction also provides a longitudinally rigid connection between the piston pin bosses and the guide portion of the piston, which construction may be used either with or without the split guide portion and separated head. The arrangement of the supporting flanges 17 between the ends of the piston pin bosses and the connections of those flanges with both the piston guide portion and the head provide a particularly strong construction, and at the same time, when the longitudinal split is used, as shown, the web structure has sufficient lateral flexibility to permit the split to close more or less under the action of the expansion forces incident to the heating of the piston.

In Figs. 5 and 6 the webs or walls 18 are slightly curved between the flanges 17 and the guide portion to thereby distribute the connection of the bosses to the guide portion more evenly around the piston. Otherwise the showing is substantially the same as in the other figures. While my piston is, of course, adapted for use in either vertical, inclined, or horizontal engines, for convenience I refer in some instances to its head end and its open end as the upper and lower ends or parts, respectively.

It will be understood further that my invention is not limited to the details of construction shown and other forms may be used without departing from the spirit or scope of the invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connection to said bosses.

2. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses integrally connected to the head and to the upper and lower part of the skirt, the outer ends of the pin bosses being spaced from the opposing parts of the skirt wall and said skirt having openings opposite the open ends of the bosses, said skirt being split longitudinally at one side between its connections to said bosses.

3. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses integrally connected to the head and to the skirt in four longitudinal lines, the ends of said bosses being spaced from the opposing parts of the wall of the skirt, said skirt having openings therethrough opposite the open ends of the bosses.

4. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head, and also connected to the skirt both above and below the bosses, said skirt being split longitudinally between its connections to said bosses.

5. An integrally cast piston comprising a head, a skirt separated at its periphery from the head, and pin bosses integrally connected to the head and to the skirt at both sides and in the zone of said bosses, the bosses having their ends spaced from the opposing parts of the skirt wall, said skirt being split longitudinally between its connections to said bosses.

6. An integrally cast piston comprising a head, a skirt, separated piston pin bosses within the skirt, and an integral flange on each of said bosses intermediate its ends, said flange extending from both sides of the boss to the piston skirt and integrally united therewith in the zone of the boss, said flanges being yieldable in the direction of the piston pin boss axis and relatively rigid in the direction of their length.

7. A piston comprising a head, a skirt, separated piston pin bosses integral with the head and disposed within the skirt, and integral transversely flexible webs extending from the intermediate part of each of said bosses to the skirt wall in the zone of the boss for supporting the bosses from the adjacent part of the skirt.

8. A piston comprising a head, a skirt having its periphery separated from the head, pin bosses in the piston spaced from the wall of the skirt and conduits leading from the top of said skirt to the interior of said bosses.

9. A piston comprising a head, a skirt having its periphery separated from the head, pin bosses in the piston, the ends of said bosses being spaced from the walls of the skirt; means integrally connecting the bosses with the head and skirt, and ports leading from the upper part of the skirt to the bosses.

10. A piston comprising a head, a skirt, separated piston pin bosses within the skirt, and an intermediate flange on each of said bosses intermediate its ends, said flange extending laterally from both sides of the boss to the piston skirt in a curve and integrally united with the skirt in the zone of the boss.

11. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the

skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

12. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction and the skirt portion being cut away adjacent the outer ends of the piston bosses.

13. A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

14. A piston for internal combustion engines comprising in combination a head portion having an end wall and a ring-packed side wall, a guide portion having an annular bearing surface at the open end thereof and diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall of the head portion by an unobstructed air gap, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of longitudinally disposed walls connected to said bosses and each joined at relatively widely separated points to the said cylinder-engaging parts above and below the plane of the boss axis, said walls being disposed within the maximum diameter of the piston, and integral, rigid connections extending from the bosses to the head portion.

15. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

16. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air gap and one of said cylinder-engaging parts being split longitudinally from its upper edge to its lower edge, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, and walls integrally uniting said bosses, the guide portion and the head portion, said split in the cylinder-engaging face of said guide portion being disposed between the connections thereto of said walls.

17. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and arcuate cylinder-engaging parts joining said diametrically opposite parts at the lower end of the guide, the said diametrically opposite parts each being separated at its upper end from the side wall of the head section by an air gap, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of transversely flexible walls integrally connected to said bosses and integrally joined to the cylinder-engaging parts at points above and below the plane of the boss axis, said walls being disposed within the maximum diameter of the piston, and connections extending from the bosses to the head portion and integral therewith.

18. A piston for an internal combustion engine cylinder comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to receive the side thrust of a connecting rod and arcuate cylinder-engaging parts joining said diametrically opposite parts at the lower end of the guide portion to provide an annular bearing face adjacent the open end of the piston, each of said diametrically opposite cylinder-engaging parts being separated at its upper end from the side wall of the head portion, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of spaced walls, each of which connects one of said bosses to said cylinder-engaging parts at points above and below the plane of the boss axis, one of said diametrically opposite cylinder-engaging parts being split longitudinally from its upper edge to its lower edge between the connections to said walls, and connections extending from the bosses to the head portion, whereby said piston, due to expansion of the parts during operation, is compressed to a smaller wall pressure.

19. A piston for internal

tion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air gap, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of walls connected to said bosses and joined to the said cylinder-engaging parts at points above and below the plane of the boss axis, and rigid, integral connections between the bosses and the head portion comprising upward extensions of said walls with strengthening ribs disposed substantially at right angles thereto.

20. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air gap, spaced supporting connections between said head and guide portions, one of said cylinder-engaging parts being split longitudinally from its upper edge to its lower edge between said supporting connections, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of walls disposed within the maximum diameter of the piston and integrally connected to said bosses and to said cylinder-engaging parts and to said head portion.

21. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said wall by an air gap and one of said cylinder-engaging parts being split longitudinally from its upper edge to its lower edge, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, and walls integrally uniting said bosses, the guide portion and the head portion, the guide structure and said walls being adapted to permit the split of the cylinder-engaging part to close more or less under the action of forces incident to the heating of the piston during operation.

22. A piston comprising in combination a head portion having an end wall and side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air gap, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of walls connected to said bosses and joined to the said cylinder-engaging parts at points above and below the plane of the boss axis, and rigid, integral connections between the bosses and the head portion comprising upward extensions of said walls, one of the said cylinder-engaging parts being split longitudinally between the points of attachment thereto of the said walls.

23. In a piston, the combination of a head portion having an end wall and a side wall, a guide portion, a pair of separated piston pin bosses connected to the head portion, said webs disposed longitudinally of the piston integrally joining the inner parts of said bosses to the guide portion in the zone of said bosses.

24. A piston for internal combustion engines comprising a head portion, a guide portion, a pair of separated pin bosses connected to the head portion and arranged within the maximum diameter of the piston whereby the outer ends of the bosses will be out of contact with the cylinder wall, and a flange on each of said bosses near its inner end extending laterally from both sides of the boss to the guide portion in a curve and integrally united with the guide portion in the zone of the boss, said flanges being disposed longitudinally of the piston.

25. An integrally formed piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a pair of separated pin bosses, and a guide portion connected to said bosses and having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall of the head portion by an air gap and being split longitudinally between its connections to said bosses to accommodate expansion incident to the heating of the piston.

26. An integrally formed piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air gap, spaced supporting connections between said head and guide portions, one of said cylinder-engaging parts being split longitudinally between the supporting connections from its upper edge to its lower edge, and a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts.

27. A one-piece piston with a solid crown portion and a skirt portion separated therefrom by spaced integral connections [illegible] having formed in its peripheral face a groove [illegible] and a circular [illegible] and in the [illegible] between the spaced integral connections [illegible] and of the piston, and [illegible] disposed [illegible] piston [illegible]

tions in the skirt which are capable of unrestrained outward and inward movement, the bearing faces of said piston diametrically opposite said longitudinal slot being circumferentially continuous between the spaced integral connections of the skirt to the head on that side of the skirt.

28. A one piece piston provided with a solid head portion and a skirt portion having oppositely disposed thrust bearing faces, said skirt portion having a longitudinally extending slot formed through the thickness of its wall, said slot extending from the rear edge of the skirt portion through one of said thrust bearing faces and forming adjacent disconnected parts of a thrust bearing face in said skirt portion which are capable of being moved inwardly or outwardly without restraint.

29. A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

30. A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion separating from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being co-operably connected at their opposite ends to said cylinder engaging portion.

31. A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

32. A piston closed at one end and open at its opposite end, said piston having an annular cutting formed through the thickness of its peripheral wall thereby providing a separated sleeve-like skirt which is approximately cylinder bearing in its entirety, a pair of wrist pin bearings depended from said piston end and said bearings free from engagement with said skirt, connecting means extending from each of said bearings to said skirt, said skirt being provided with a longitudinal slot cut through the thickness of its wall between its connections to said supporting means and extending from the open end thereof to said connecting means.

33. A piston for use in an engine cylinder comprising a head, a skirt, parts of said skirt forming oppositely positioned main bearing portions designed to take the side thrust of a connecting rod, a pair of spaced wrist pin bosses, means integrally connecting the bosses to the head, and means integrally connecting each boss to both of said opposite main bearing portions, one main bearing portion being circumferentially continuous between its connections to the bosses and the other main bearing portion being separated from the head and slit longitudinally between its connections to the bosses to render said slit main bearing portion yieldable in response to pressure from the engine cylinder during operation.

34. A piston for use in an engine cylinder comprising a head, a skirt, parts of said skirt forming oppositely positioned main bearing portions to take the side thrust of a connecting rod, a pair of spaced wrist pin bosses, means integrally connecting the bosses to the head, and means integrally connecting each boss to both of said opposite main bearing portions, one main bearing portion being circumferentially continuous between its connections to the bosses and the other main bearing portion being separated from the head and slit longitudinally its entire length between its connections to the bosses to render said slit main bearing portion yieldable in response to pressure from the engine cylinder during operation.

35. A single-piece, integral piston, comprising a head, a pair of spaced wrist pin bosses having a common axis, a skirt, and means yieldingly connecting the skirt to the head, said skirt being integral and having main cylinder bearing faces disposed on opposite sides of the axis of said wrist pin bosses, said skirt being separated from the head at the upper end of each of said bearing faces, one only of said main cylinder bearing faces being slit longitudinally between its connections to the head, whereby said head may expand and contract during operation of said piston substantially independently of said skirt portion when expansion of the skirt portion is restrained.

36. A single-piece, integrally cast piston for use in an engine, comprising a head, wrist pin bosses having a common axis, a skirt, and means connecting said head and bosses and skirt together, said skirt being integral and having a main bearing portion disposed on each side of the said wrist pin boss axis and designed to take the side thrust produced by the angularity of the connecting rod of the engine, said [illegible] slit through its wall on each side of the boss axis, portions of said skirt on the pressure and side of the piston skirt being slit longitudinally between its connections to said bosses to provide a peripheral [illegible] portion in the said [illegible] side of the

said piston that is capable of yielding in response to pressure from the engine cylinder during operation of the piston.

37. A single-piece, integral piston for operation in an internal combustion engine cylinder, comprising a head, spaced wrist pin bosses, a longitudinally slitted one piece skirt that is yieldable in response to cylinder wall pressure having cylinder-engaging faces disposed at opposite sides of the axis of said bosses and designed to yieldingly engage the walls of the cylinder during operation, said head and skirt being separated at the upper end of each of said cylinder-engaging faces, and means yieldingly connecting the skirt to said head including means connecting the bosses and the skirt, said means connecting said bosses and said skirt being substantially rigid in the direction transverse to the axis of the bosses, whereby said head portion may expand and contract during operation of said piston without binding engagement of the skirt with the walls of the cylinder.

38. A single-piece, integrally cast piston for use in an engine, comprising a head, wrist pin bosses having a common axis, a skirt, and means connecting said head and bosses and skirt together, said skirt being integral and having a main bearing portion disposed on each side of the said wrist pin boss axis and designed to take the side thrust produced by the angularity of the connecting rod of the engine, said piston having a transverse slit through its wall on both sides of the boss axis, one only of said main bearing portions being slit longitudinally between its connections to said bosses to provide a peripheral bearing portion therein that is capable of yielding outward and inward movement relative to the head during operation of the piston.

39. A piston for an engine cylinder comprising a skirt, a head separated from the skirt wall around its entire periphery, said skirt being longitudinally slit to render the skirt wall yieldable on every diameter in response to cylinder wall pressure, wrist pin bosses, and means rigidly connecting said bosses to the head and yieldingly connecting said bosses to the skirt whereby said skirt is yieldable in response to cylinder wall pressure.

40. A piston for an engine cylinder comprising a cylindrical skirt that is longitudinally slit and yieldable on every diameter in response to cylinder wall pressure, a pair of wrist pin bosses having a common axis, said skirt being integral and having a main cylinder bearing portion on each side of the axis of said wrist pin bosses, a head peripherally separated from at least one of said main cylinder-bearing portions, said means connecting the bosses with the skirt, said means being yieldable in the direction of the boss axis and substantially rigid in the direction transverse to said axis, whereby said head may freely expand and contract during operation of the piston when expansion of the skirt is restrained.

41. A piston comprising a head, a pair of spaced wrist pin bosses rigidly carried by the head and having a common axis, a skirt that is separated from the head on each side of the wrist pin bosses and longitudinally slit between the bosses on one side only of the bosses to render the skirt circumferentially yielding on that side of said bosses and circumferentially non-yielding on the opposite side of said bosses, and means substantially non-yielding in the direction transverse to the boss axis connecting the bosses with the skirt.

42. A piston for an engine cylinder comprising, a head, and an integral guide portion having diametrically opposite cylinder-engaging parts thereof designed to receive the thrust of a connecting rod during operation, one of said cylinder-engaging parts being rigidly connected to the head in the direction of load thrust from the connecting rod, the opposite cylinder-engaging part being yieldable relative to the head in response to cylinder wall pressure, whereby thermal expansion of said piston will not cause it to seize in the cylinder during operation.

43. A piston for an internal combustion engine cylinder, comprising a head portion carrying packing means and an integral guide portion integral with the head portion and having diametrically opposite cylinder-engaging parts thereof designed to receive side thrust from a connecting rod, one of said cylinder-engaging parts being slit longitudinally to render it materially more yielding than the opposite cylinder-engaging part.

In testimony whereof I affix my signature.

EDWARD J. GULICK.

CERTIFICATE OF CORRECTION.

Patent No. 1,815,733. Granted July 21, 1931, to

EDWARD J. GULICK.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, line 33, claim 30, for the word "separating" read and separated; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of September, A. D. 1931.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.

PLAINTIFFS' EXHIBIT NO. 3.
Jardine Patent in Suit.
U. S. Patent No. 1,763,523, June 10, 1930,
To F. Jardine.
Piston.
(Filed January 27, 1934.)

1292

June 10, 1930. F. JARDINE. 1,763,523

PISTON

Original Filed March 11, 1920 2 Sheets-Sheet 1

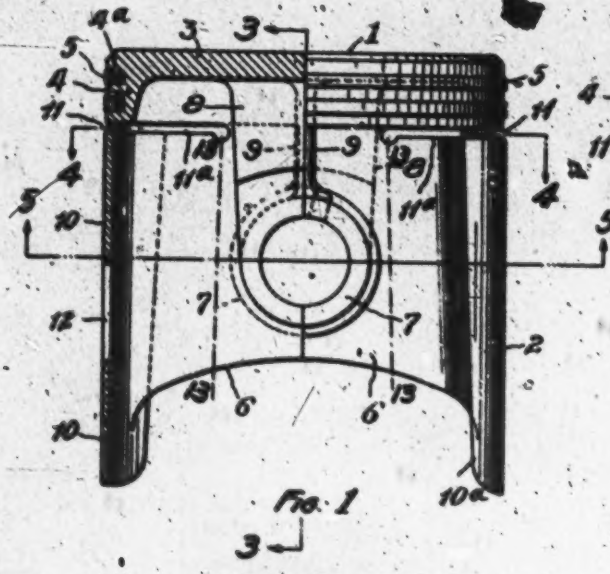

Fig. 1

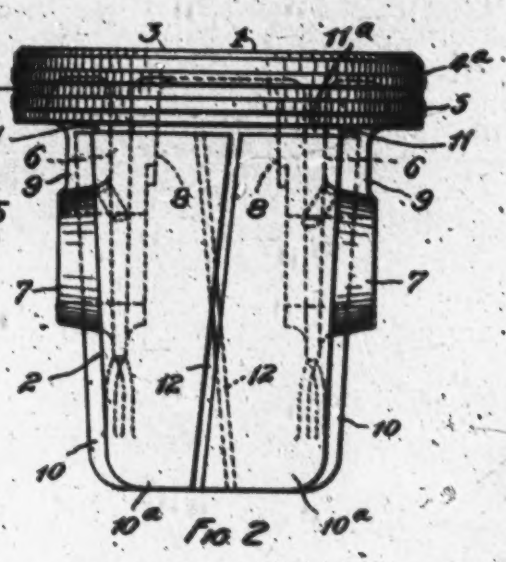

Fig. 2

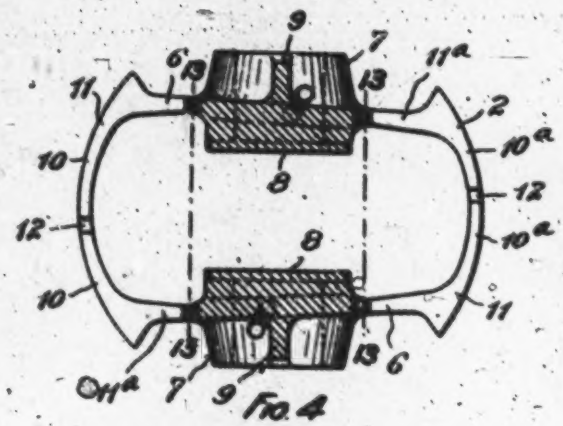

Fig. 4

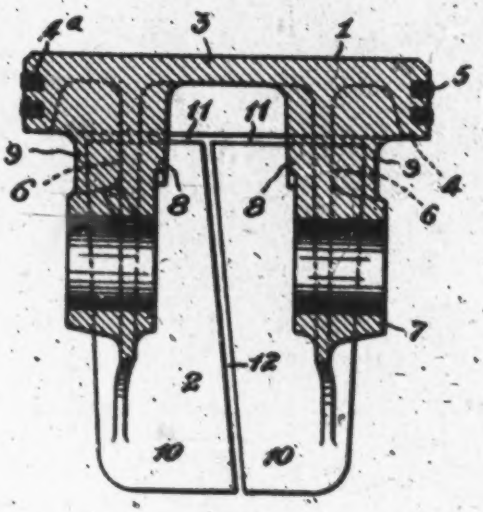

Fig. 3

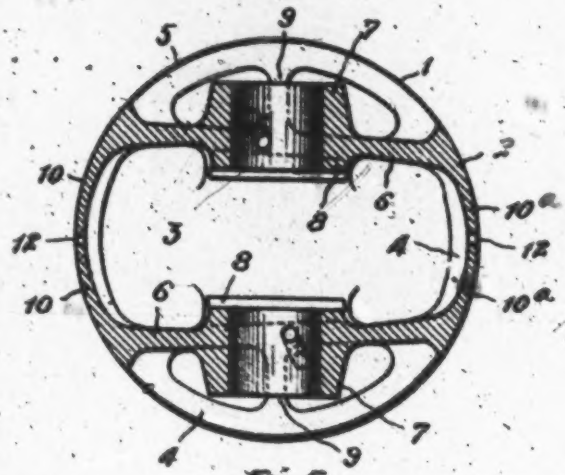

Fig. 5

INVENTOR:
Frank Jardine
BY
Kerr & Page
ATTORNEY.

1294

June 10, 1930. F. JARDINE 1,763,523

PISTON

Original Filed March 11. 1920 2 Sheets-Sheet 2

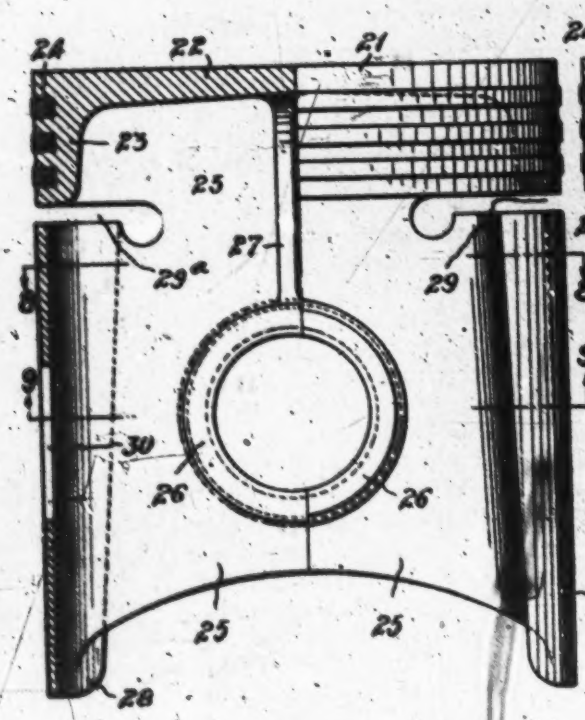

Fig. 6

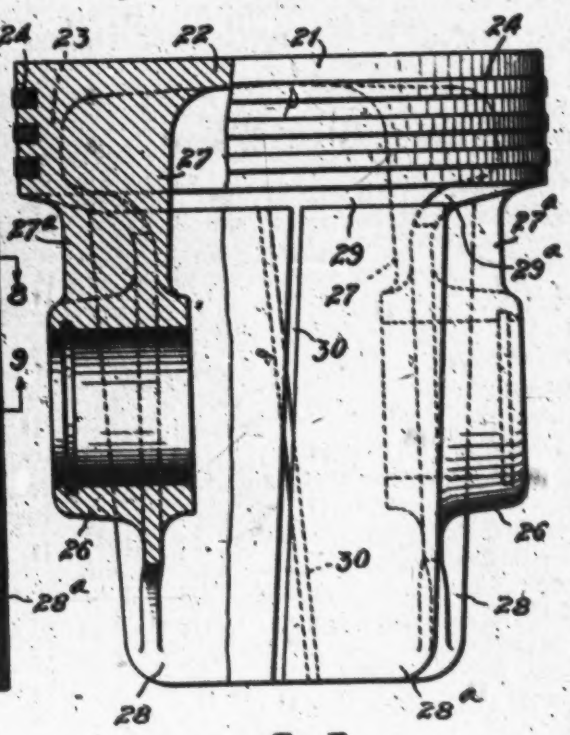

Fig. 7

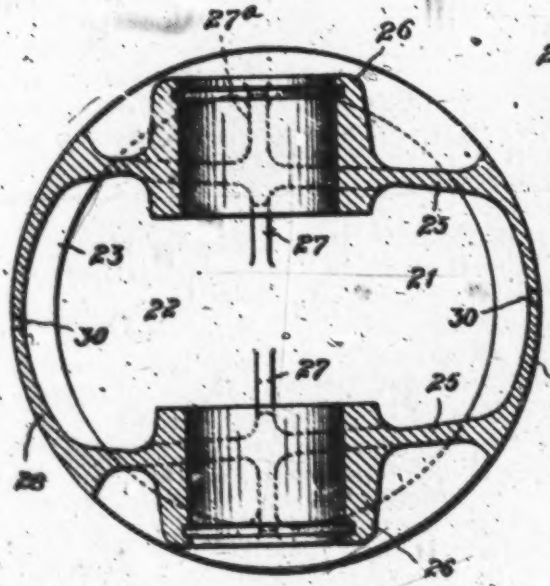

Fig. 9

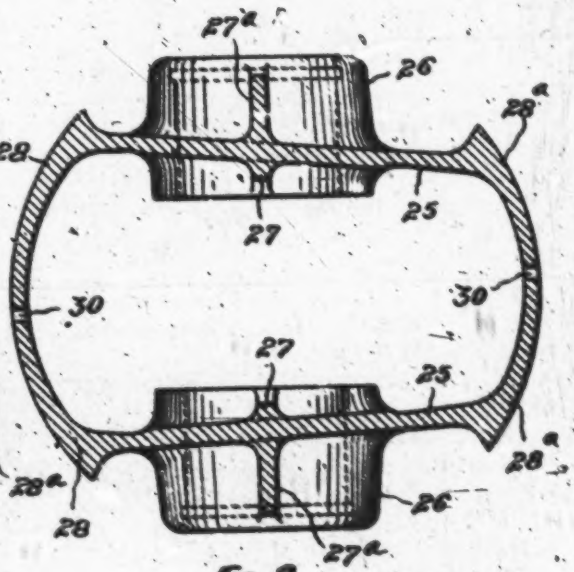

Fig. 8

INVENTOR:
Frank Jardine
BY Ray S. Fehr
ATTORNEY.

Patented June 10, 1930

1,763,523

1295

UNITED STATES PATENT OFFICE

FRANK JARDINE, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE CLEVELAND TRUST COMPANY, AS TRUSTEE, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

PISTON

Application filed March 11, 1926, Serial No. 94,257. Renewed March 3, 1931. Serial No. 520,202.

My invention relates to pistons for internal combustion engines and especially to pistons formed of light weight metals or alloys.

The invention has for its chief object the construction of a light alloy piston which, with relatively small initial clearance, will operate satisfactorily at all temperatures in an engine cylinder.

Another object of the invention is to produce a piston of the character noted that will lend itself to economic methods of manufacture.

Because of the high co-efficient of expansion of suitable light alloys such as aluminum alloys, as compared with iron, it is often difficult to fit an internal combustion engine satisfactorily operable with iron pistons, with light alloy pistons so that such pistons will not be noisy and will not pump oil when cold, or will not stick or score the cylinder wall when heated. I have found that these difficulties can be overcome by constructing a piston with its skirt or guide portion supported and slotted or divided in a manner to permit deformation and deflection of parts thereof without interfering with the performance of the essential functions of the respective parts.

To facilitate an understanding of the invention two forms or embodiments thereof are described hereinafter and are illustrated in the accompanying drawings in which

Fig. 1 is a view partly in side elevation and partly in section of a piston constructed in accordance with my invention.

Fig. 2 is a side elevation of the same piston viewed at right angles to Fig. 1.

Fig. 3 is a section on the line 3—3 of Fig. 1.

Fig. 4 is a section on the line 4—4 of Fig. 1.

Fig. 5 is a section on the line 5—5 of Fig. 1.

Fig. 6 is a view partly in side elevation and partly in section of a piston of modified form.

Fig. 7 is a side elevation of the same viewed at right angles to Fig. 6 and with parts broken away and shown in section.

Fig. 8 is a section on line 8—8 of Fig. 6.

Fig. 9 is a section on line 9—9 of Fig. 6.

Referring first to Figs. 1 to 5, the piston shown comprises a head portion 1 and a guide or skirt portion designated in its entirety by 2. The head portion consists of a head disc 3 and a peripheral flange 4 in which are grooves 4ª for the ordinary piston rings 5. On the lower face of the head disc 3 are formed two depending webs 6 integral with the disc. These webs carry bosses 7 which are adapted to receive the ordinary wrist pin. Ribs 8 may be provided along the webs 6 between the head disc and the bosses for strengthening the webs 6 and supporting the inner ends of the bosses. Additional ribs 9 may be formed on the outer sides of webs 6 as shown to strengthen them and to support the outer ends of the bosses.

The guide portion 2 comprises two pairs of guide segments 10 and 10ª curved to conform to the engine cylinder, one pair being located on either side of the bosses. The segments are integral with the webs 6 and are supported and connected to the head portion 1 by means of these webs. The segments at their upper ends are separated from the flange 4 of head portion 1 by slots 11 and are further isolated from the head by slots 11ª formed in webs 6. The segments of each pair are separated from one another by a longitudinally extending slot 12, said slot preferably being inclined or spirally arranged as shown. In the construction shown the guide portion formed by segments 10ª is designed to take the diagonal thrust of the piston rod during the compression stroke of the engine and as said thrust is less than the corresponding thrust during the explosion stroke, said portion 10ª is made narrower circumferentially than the other portion 10 so as to save weight.

The flange 4 of the head portion 1 has a smaller outer diameter than the guide portion 2, the diameter of the latter being only slightly smaller than the internal diameter of the cylinder in which it is to function.

In the operation of an internal combustion engine the piston usually is heated to a higher temperature than the cylinder wall and expands radially to a greater amount than the cylinder. This expansion reduces the clearance between the piston skirt or guide part and the cylinder wall and in the case of pistons not constructed according to

my invention, if the initial clearance provided is small, scoring of the cylinder walls or piston, or seizure of the piston in the cylinder may result. With my invention, however, the guide segments 10, 10ª, are capable of deformation or displacement as the piston guide parts expand, the segments being forced toward one another so as to tend to close up the slots 12. The webs 6 and guide segments preferably are so designed that this displacement of the segments 10, 10ª, is permitted by virtue of a bending of the webs 6 at points remote from the guide segments. To this end, as shown in Fig. 4, the thickness of the guide segments is increased toward the webs 6 and the webs 6 are decreased in thickness from the guide portions inward toward the bosses to points in line with the inner ends of the slots 11ª. This gives in effect a cantilever structure weakest at its support, namely, along the dotted lines 13 in Figs. 1 and 4. Thus the reaction force of the cylinder wall on the outer faces of the guide segments as the piston expands tends to cause bending of the webs 6 along said lines 13. Due to the bending of the web sections 6 and the forcing together of each pair of segments, the guide part of the piston may undergo a considerable thermal expansion without a corresponding increase in the outer diameter thereof and thus a small initial clearance can be used without danger of scoring or seizure of the piston.

By variation of the thickness and design of the webs 6 and the location of the slots 11ª therein, the force necessary to cause the guide segments 10 and 10ª to approach one another along the slot 12, or in effect to maintain the outer diameter of the piston substantially constant, can be easily regulated. The webs 6 will tend to bend along a line extending vertically downward from the ends of slots 11ª and if said slots are terminated closer to the guide segments 10, 10ª the region of bending will be moved outward correspondingly. Likewise a thickening of the webs 6 near the bosses will tend to move the point of bending or flexing closer to the guide segments 10, 10ª. An increase of the thickness of the webs 6 obviously will increase the force necessary to cause the guide segments 10, 10ª to approach one another along the slot 12.

In Figs. 6 to 9 a modified form of piston is shown. The head portion 21 is formed with a head disc 22 and a depending peripheral flange 23 in which may be formed grooves 24 for the ordinary piston rings. Depending webs 25 are formed at diametrically opposite parts of the lower edge of the peripheral flange 23. These webs carry bosses 26 for the customary wrist pin, the inner ends of the bosses being supported by ribs 27 which join the webs 25 and extend from the inner ends of the bosses 26 to the lower side of the head disc 22, while the outer ends of said bosses are supported by ribs 27ª.

On either side of the bosses 26 are formed pairs of guide segments 28 and 28ª similar to those shown in Figs. 1 to 5. These segments are united with webs 25 as shown and are separated from the flange 23 by slots 29 and further isolated from the head by slots 29ª in the walls 25. The guide segments of each pair are separated from one another by longitudinally extending slots 30.

It will be seen that this last form of construction is based upon the same principles as the first form and further detailed description is therefore unnecessary. The main difference between the last form of construction and that first described resides in the webs 25 which support the wrist pin bosses and the guide portions, said walls being joined to the head structure at the lower edge of the ring flange 23 rather than springing from the head disc as in the first form of construction.

From the foregoing description the operation of pistons embodying my improvements will readily be understood. It will be seen that an aluminum alloy piston embodying my invention can be fitted to the engine cylinder with a very small clearance and that compensation for the relatively large thermal expansion of the guide section of the piston is provided by the displacement of the guide segments which results from the reaction force of the cylinder wall on the outer faces of the guides. As above indicated the reaction force necessary to displace the guide parts and effect such compensation can readily be controlled by properly forming and proportioning the guide parts. In this connection it will be obvious to the designer that account must be taken of such factors as compression pressures, piston diameter and piston stroke as determining the lateral thrust to which the guide parts will be subjected. It is obvious that the compensating displacement of the guide parts should require a thrust great enough to insure adequate mechanical strength of the piston and small enough to obviate scoring of the piston and cylinder or seizure of the piston.

While I have shown my invention applied to the slipper type of piston as distinguished from the skirt type it is to be understood that the invention is essentially applicable to other forms of construction, the scope of the invention being indicated by the appended claims.

What I claim is—

1. In a piston for an internal combustion engine, the combination of a head having ring grooves therein, a plurality of webs integral with said head and having diametrically opposite piston pin bosses therein, a skirt integral with said webs relieved adjacent said webs and separated from the head by cir-

cumferential slots and provided with a longitudinal slot connecting the lower end of the piston with one of the circumferential slots.

2. In a piston for an internal combustion engine the combination of a head comprising a head disc and a peripheral flange having ring grooves therein, a pair of chordal webs, substantially rectangular in shape and located opposite each other in the piston, connected integrally at their upper edges to the peripheral flange of the piston, diametrically opposite wrist pin bosses, one in each of said webs, a skirt for said piston integrally connected to each of the side edges of the webs and cut away so as to expose each of the rectangular webs and the piston pin bosses from the outside of the piston, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston.

3. An internal combustion engine piston comprising a head having a depending ring flange, webs integrally cast to the ring flange and depressed within the circumference defined by the ring flange, wrist pin bosses cast in the webs, and curved guide means integrally cast to the webs and provided with a longitudinal slit disposed between the ends of the webs on one side of the piston, the outer surface of the guide means being disposed in a circumference outwardly of the outer surface of the webs and merging into the latter at included angles sufficiently great to permit the removal of a permanent mold part used to form the outer surface of the piston.

4. In a piston for an internal combustion engine, the combination of a head having a depending circumferential flange provided with ring grooves on the exterior thereof, chordal webs integral with the head and depending therefrom in opposite positions, piston pin bosses, one located in each web opposite each other, a skirt portion cut away from the head to expose the bosses in the webs and provided with curved bearing faces integral with the webs and connected to the ends of the webs opposite each other, each of said bearing faces being separated from the head except for the integral connection through the webs and one of said bearing faces having a substantially vertical slot therein.

5. In a piston for an internal combustion engine, the combination of a head having a depending circumferential flange provided with ring grooves on the exterior thereof, chordal webs integral with the head and depending therefrom in opposite positions, piston pin bosses one located in each web opposite each other, ribs integral with and substantially perpendicular to the webs joining the webs and the head, a skirt portion cut away from the head to expose the bosses in the webs provided with curved bearing faces integral with the webs and connected to the ends of the webs opposite each other, each of said bearing faces being separated from the head except for the integral connection through the webs and one of said bearing faces having a substantially vertical slot therein.

6. In a piston for an internal combustion engine, the combination of a head having a depending circumferential flange provided with ring grooves on the exterior thereof, chordal webs integral with the head and depending therefrom in opposite positions, piston pin bosses, one located in each web opposite each other, ribs integral with and substantially perpendicular to the webs joining the webs, the bosses and the head together, a skirt portion cut away from the head to expose the bosses in the webs and provided with curved bearing faces integral with the webs and connected to the ends of the webs opposite each other, each of said bearing faces being separated from the head except for the integral connection through the webs and one of said bearing faces having a substantially vertical slot therein.

7. A piston for an internal combustion engine comprising a head portion having a depending ring flange, a skirt portion, said skirt portion comprising a pair of substantially parallel webs carried by the head portion and provided with opposed wrist pin bosses, bearing portions carried by the ends of said webs and separated from the head by air gaps, the laterally outer faces of said web portions being free from laterally overhanging edge portions of the bearing faces, one of said bearing faces being provided with a longitudinal slot disposed intermediate the end portions of said bearing face.

8. In a piston for an internal combustion engine, the combination of a head having a cylindrical ring flange, oppositely disposed webs integral with the flange and carrying diametrically opposite piston pin bosses, a skirt, integral with said webs and cut away to expose the sides of said webs and separated from the ring flange by circumferential slits and provided with a longitudinal slit disposed between the ends of the webs.

9. In a piston for an internal combustion engine, the combination of a head comprising a disc and a peripheral flange having ring grooves therein, a pair of chordal webs connected to the flange of the head by outwardly flaring extensions, oppositely disposed wrist pin bosses in the webs, and a cylindrical skirt cut away to expose the webs and integrally connected to the ends of the latter, the skirt being separated from the head between the said webs by circumferential slits and the skirt having a longitudinally extending slit disposed between the ends of the webs on one side of the piston.

10. In a piston for an internal combustion engine, the combination of a piston head including a depending ring flange, oppositely disposed webs depending from the ring flange and disposed inwardly thereof, wrist pin bosses in the webs, and curved bearing means integrally connected to the webs and separated from the head by air gaps extending circumferentially of the piston between the ends of the webs, the said bearing means having a slit located between the ends of the webs and extending in a direction lengthwise of the piston.

11. In a piston of an internal combustion engine, the combination of a piston head having a cylindrical ring flange depending therefrom, webs integral with the flange extending convergingly inwardly of the piston from the opposite portions of the flange and then lengthwise of the piston in substantially parallel arrangement, wrist pin bosses in the webs, and a skirt joined to the ends of the webs on opposite sides of the bosses and cut away to expose substantially all of the sides of the webs, all the foregoing parts being integrally connected together, there being circumferentially extending air gaps separating the head and skirt between the webs and a slot in one side of the skirt between the ends of the webs and extending in a direction lengthwise of the piston.

12. In a piston for an internal combustion engine, the combination of a piston head comprising a disc with a depending peripheral ring flange, a skirt separated from the head by circumferentially extending air gaps, chordal webs integrally connected at their ends to the skirt with their outer surfaces near the points of connection with the skirt diverging outwardly to merge into the outer surfaces of the skirt, wrist pin bosses integrally formed with the webs, and integral connections between the depending flange of the head and the adjacent ends of the webs, said connections extending from the flange inwardly and lengthwise of the piston and merging into the webs with outwardly diverging surfaces, the skirt having a longitudinally extending slit formed on one side thereof between the ends of the webs.

In testimony whereof, I hereunto affix my signature.

FRANK JARDINE.

PLAINTIFFS' EXHIBIT NO. 4.
Maynard Patent in Suit.
U. S. Patent No. 1,655,968, January 10, 1928,
To H. E. Maynard.
Piston.
(Filed January 27, 1934.)

1300

Jan. 10, 1928. 1,655,968

H. E. MAYNARD

PISTON

Filed Jan. 3, 1921

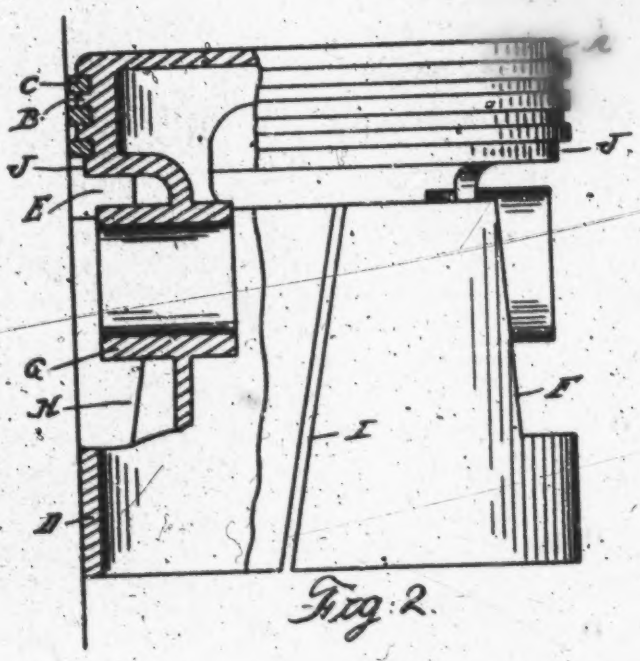

Fig. 2.

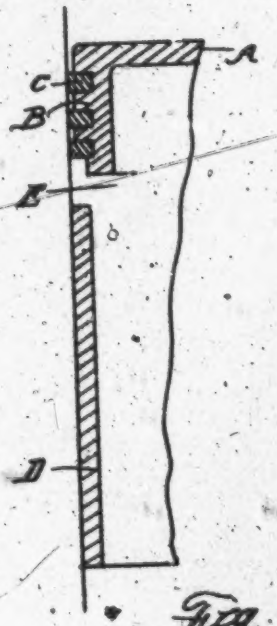

Fig. 3

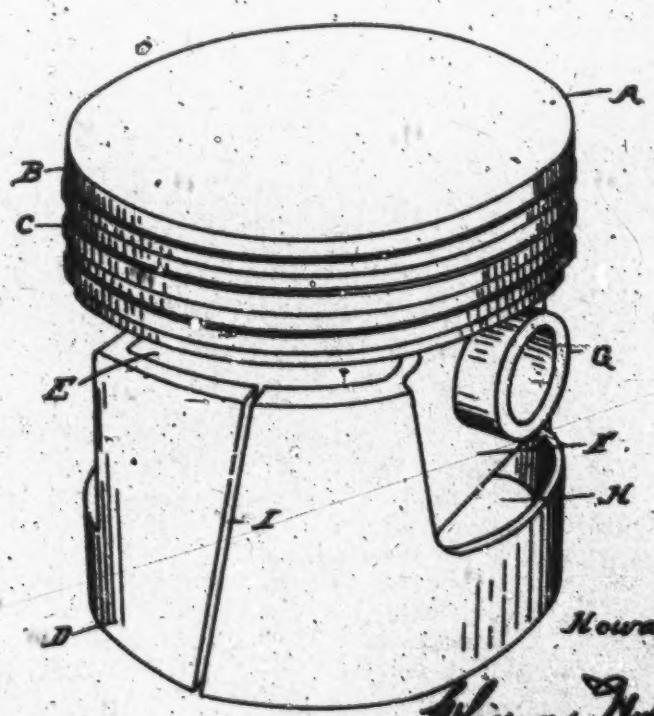

Fig. 1.

Inventor
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By Whittemore, Hubbard & Whittemore
Attorneys

Patented Jan. 10, 1928. 1,655,968

1301

UNITED STATES PATENT OFFICE.

HOWARD R. MAYNARD, OF DETROIT, MICHIGAN, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO CHRYSLER CORPORATION, OF HIGHLAND PARK, MICHIGAN, A CORPORATION OF DELAWARE, AND ONE-HALF TO ALUMINUM COMPANY OF AMERICA, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

PISTON.

Application filed January 5, 1921. Serial No. 434,467.

The invention relates to pistons designed for use in internal combustion engines and has for its object the prevention of "pumping" of oil and the "freezing" due to excessive expansion. In the present state of the art it is usual to construct pistons with a cylindrical ring portion having a relatively large clearance with reference to the diameter of the cylinder, and a skirt portion more closely fitting the same and which holds the piston in proper alignment and prevents side slapping. To avoid sticking or freezing of this skirt, due to expansion, certain constructions of pistons have provided the skirt with a longitudinal slot therein to compensate for expansion, but there is one serious difficulty with all such constructions, viz, the tendency for the lubricating oil to work up beyond the skirt and rings and into the explosion chamber. This results in the formation of carbon and other difficulties incident thereto. With the present invention I have overcome this difficulty by arranging between the cylindrical ring portion and the skirt portion a continuous annular groove. This will receive the oil creeping past the skirt and permitting the same to drop back in the cylinder without providing any bridge for its passage to the ring portion. The result is that the cylinder will be fully lubricated, while the excess of lubricant will be scraped off by the lowermost piston rings into the annular groove, where it is permitted to drop back into the cylinder.

In the drawings:

Figure 1 is a perspective view of my improved construction;

Figure 2 is a transverse section thereof; and

Figure 3 is a similar view in plane at right angles to Figure 2.

A is the piston head having a depending cylindrical portion B grooved to receive the rings C and of a diameter to afford abundant clearance within the engine cylinder. D is a skirt, which is preferably of a diameter to closely fit the cylinder. This skirt is itself discontinuous with the cylindrical portion B of the piston, being separated therefrom by a groove E, which extends completely around the same. The connection between the two parts is formed by webs F on diametrically opposite sides of the piston, said webs extending inward from the portion B and vertically downward and having formed integral therewith the bearings G for the wrist pin. These webs are connected to the skirt on their opposite vertical edges, but are not connected thereto either at top or bottom. Thus there are formed the recesses H surrounding the bearings G with segmental skirt portions on opposite sides thereof and an annular skirt portion below said segmental skirt portions. One of the sides of the skirt between the points of attachment of the webs thereto is longitudinally slitted, as indicated at I, and this slit compensates for expansion and permits the skirt to conform itself to the cylinder.

With the construction as described, when the piston is in operation, the lubricant upon the wall of the cylinder is spread by the skirt portion of the piston and will be forced upward to the groove E at the upper end of the skirt. Further creeping is prevented by this groove and when the accumulation of oil is sufficient, it will drop back inside of the skirt. At no time is there a body of the oil adjacent to the piston rings and for this reason when the engine is upon suction stroke, any leakage past the ring cannot draw oil upward. As a further safeguard, the cylindrical portion B below the lowermost of the ring C is cut away to provide a further clearance, as indicated at J, this clearance being sufficient to prevent the bridging of the oil thereacross. Thus on each downward stroke of the piston, the lowermost ring will scrape all surplus oil from the surface of the cylinder and in the upward stroke the oil thus accumulated will pass through the groove E and downward. Any oil accumulating in the recesses H will follow down the webs F and there is no chance at any point for the accumulation of oil adjacent to the rings.

What I claim as my invention is:

1. A piston comprising a head having a cylindrical ring portion depending therefrom and a skirt portion arranged beneath said ring portion and separated therefrom by a continuous annular groove, said skirt having a pair of spaced segmental portions, webs on

diametrically opposite sides of the piston, extending inward from said cylindrical portion and vertically downward, the opposite edges of said webs being connected to the said segmental portions of the skirt, and said skirt having an annular portion below said segmental portions disconnected from the lower ends of said web.

2. A piston comprising a head having a depending cylindrical ring portion of relatively large clearance with respect to the diameter of the cylinder, and a skirt portion below said ring portion closely fitting said cylinder and separated from the ring portion by a continuous annular groove, webs on diametrically opposite sides of said piston extending inward from said cylindrical portion and downward parallel to each other, the opposite vertical edges of said webs being connected to the skirt, said skirt having an annular portion below said webs disconnected from the lower ends of said webs and there being also provided a slit completely through the skirt from the lower to the upper end thereof, and wrist pin bearings carried by said webs.

3. A piston comprising a head, a cylindrical skirt beneath said head having recesses in diametrically opposite sides thereof, parallel webs extending downwardly from said head and having the opposite side edges thereof connected to the side edges of the recesses in said skirt, separating openings being provided between the lower ends of said webs and said skirt and between the upper edges of said skirt and said head, and wrist pin bearings carried by said webs.

4. A piston comprising a head having a depending cylindrical portion provided with annular grooves, rings engaging said grooves, the cylindrical portion below the lowermost ring being cut away, a cylindrical skirt beneath the cylindrical portion of said head and having recesses in diametrically opposite sides thereof, webs extending downwardly from said head and having the opposite side edges thereof connected to the side edges of the recesses in said skirt, separating openings being provided between the lower ends of said webs and said skirt, and wrist pin bearings carried by said webs, one side of said skirt between the points of attachment of said webs thereto being slit longitudinally.

5. A piston comprising a head, a cylindrical skirt beneath said head, parallel webs extending downwardly from said head and connected to said skirt separating recesses being provided between the lower ends of said webs and said skirt and between the upper ends of said skirt and said head, one side of said skirt between the points of attachment of said webs thereto being slitted longitudinally, and wrist pin bearings carried by said webs.

6. In a piston for an internal combustion engine, the combination of a head, a plurality of webs integral with said head and having oppositely disposed wrist pin bosses mounted one in each web, a skirt integral with said webs relieved adjacent said webs to a point between the bosses and the end of the skirt, said piston being provided with circumferential slots between the piston head and skirt and with a longitudinal slot connecting the open end of the skirt with one of the circumferential slots.

7. In a piston for an internal combustion engine, the combination of a head and a plurality of webs integral with said head, diametrically oppositely disposed wrist pin bosses, one mounted in each of said webs and integral therewith, a skirt integral with said webs, relieved adjacent said webs, said relieved portion terminating between the bosses and the end of the skirt, said piston being provided with circumferential slots between the piston head and skirt, with a longitudinal slot connecting the end of the skirt with one of said circumferential slots, and with other circumferential slots between the end of the webs and the open end of the skirt.

8. In a piston for an internal combustion engine, the combination of a head provided with a disc portion and a flange portion and with ring grooves in the flange portion, a pair of substantially rectangular shaped webs integral with and depending from the flange portion of the head, a pair of oppositely disposed wrist pin bosses mounted one in each of said webs, a cross rib in said head and integral with the disc portion and flanges of the head and with said web and piston pin bosses, a skirt for said piston extending below said webs and integrally connected to the side edges of each of said webs, said piston being provided with circumferential slots between the skirt and head, with a longitudinal slot connecting one of said circumferential slots with the bottom edge of the skirt and with circumferential slots between the lower edges of the webs and the adjacent portion of the skirt.

9. A piston for an internal combustion engine, comprising a head, oppositely disposed walls depending from and connected at their upper ends to the head, bosses carried by the said walls out of direct contact with the head, and a skirt structure including two oppositely disposed bearing portions joined together by extensions below each of the said bosses and indirectly connected to the head by the said walls, the skirt structure being separated, by air gaps, from the head at its upper edge, and from the said walls below the bosses.

10. A piston for an internal combustion engine comprising a head, oppositely disposed walls depending from and connected at their upper ends to the head, the walls being depressed within the maximum diameter

of the piston, bosses carried by the said walls out of direct contact with the head, and a skirt structure, including two oppositely disposed bearing portions joined together by extensions below each of the said bosses and indirectly connected to the head by the said walls, the skirt structure being separated, by air gaps, from the head at its upper edge, and from the said walls below the bosses.

11. A piston for an internal combustion engine comprising an integral head and skirt, the said skirt consisting of oppositely disposed cylinder engaging bearing walls separated from the head by circumferential slots, a slot extending lengthwise of one of the said bearing walls, depressed walls connecting the said bearing walls, and other cylinder engaging walls connecting the first said bearing walls and separated from the said depressed walls by circumferential slots.

In testimony whereof I affix my signature.

HOWARD E. MAYNARD.

PLAINTIFFS' EXHIBIT NO. 5.
Schmiedeknecht Patent in Suit.
U. S. Patent No. 1,256,265, February 12, 1918,
To V. E. Schmiedeknecht.
Piston.
(Filed January 27, 1934.)

1306

V. E. SCHMIEDEKNECHT.

PISTON.

APPLICATION FILED JULY 14, 1917.

1,256,265.

Patented Feb. 12, 1918.

Fig-1

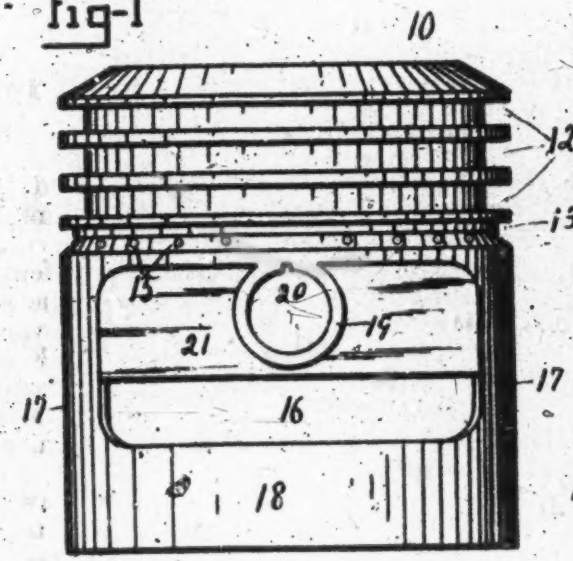


Fig-2

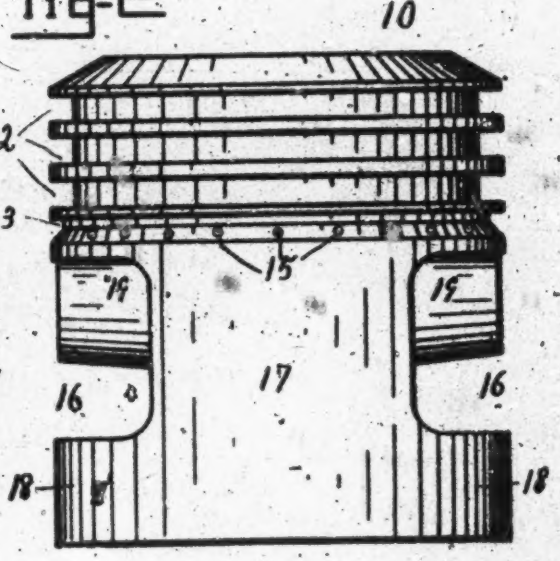


Fig-3

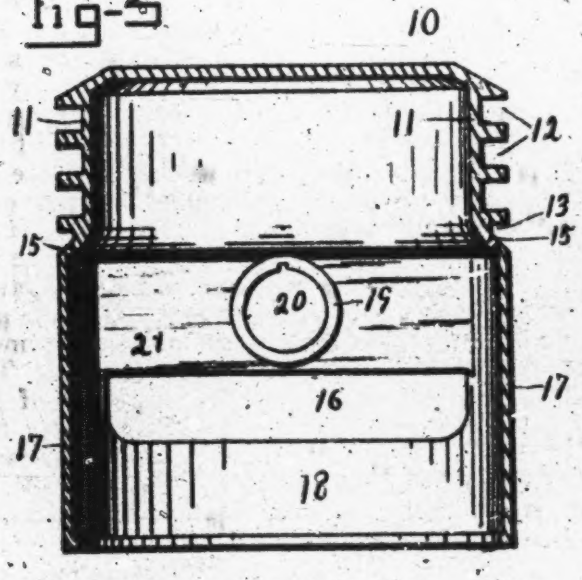


Fig-4

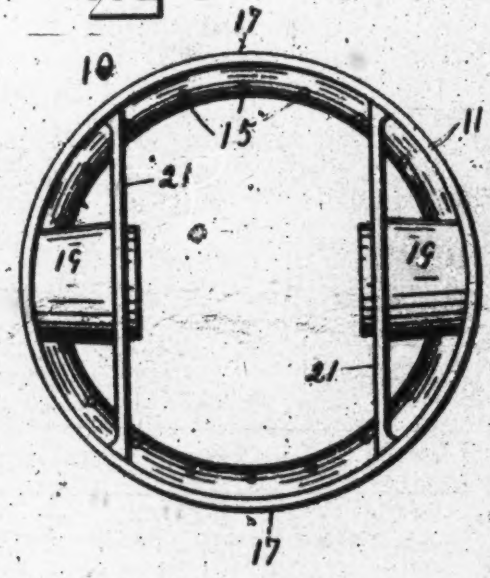
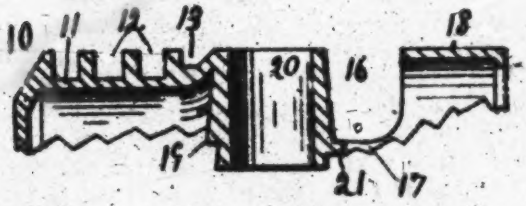


Fig-5



INVENTOR

Victor E. Schmiedeknecht

BY

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UNITED STATES PATENT OFFICE.

VICTOR E. SCHMIEDKNECHT, OF LOUISVILLE, KENTUCKY.

PISTON.

1,256,265. Specification of Letters Patent. Patented Feb. 12, 1918.

Application filed July 14, 1917. Serial No. 180,511.

To all whom it may concern:

Be it known that I, VICTOR E. SCHMIEDKNECHT, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented a new and useful Improvement in Pistons, of which the following is a specification.

This invention relates to pistons for internal combustion motors.

It has been ascertained to be essential that pistons of internal combustion motors should be as light as possible. In accordance with accepted construction pistons are hollow cylinders, closed at one end and open at the other, a connecting rod being secured interiorly thereof intermediate of their length by means of a transverse pin. Bosses projected inward from the side walls of the piston provide bearings for the pin. It was formerly thought that a shearing stress was exerted on this pin, and that the strain was transmitted to the side walls longitudinal thereof, and that the metal being under compression, the wall could be very thin, but failure of piston walls so constructed lead to the conclusion that the connecting rod exerted a bending stress on the pin by which a lateral strain was transmitted to the walls causing them to fracture around the bosses. This discovery necessitated an increase in the thickness of the walls and the use of braces or brackets extended from the bosses to the piston head, or to the wall, but these expedients tend to increase the weight of the piston. To reduce piston weight, resort has been had to the use of metals (such as aluminum, or alloys thereof) which have a lower specific gravity than cast iron, the metal commonly used; but the coefficient of expansion of aluminum is greater than that of iron, of which motor cylinders are generally made. Consequently it is difficult to get a proper fit, for if the piston is of such size as to fit in the cylinder properly when at maximum temperature, gas and oil will leak by, when as at starting, the piston is cool.

An object of this invention is to provide a piston of minimum weight, with maximum structural strength.

To the accomplishment of the foregoing and other objects, said invention consists of the novel construction, association and relative arrangement of parts, members and features hereinafter fully described and particularly pointed out in the claims appended hereunto.

In the drawing, wherein similar reference characters designate like parts in the several views, Figure 1, is a front elevation of an embodiment of the invention: Fig. 2, a side elevation thereof: Fig. 3, a central transverse section on Fig. 1: Fig. 4, a bottom plan view: and Fig. 5, a fragmental sectional view.

Referring now in detail to the drawing, the reference character —10— designates, as an entirety, a piston, the side walls, —11— of which are provided with a plurality of grooves —12— adapted for the reception of piston rings. An oil groove —13— is located just below the groups of piston ring grooves, and from the floor of this groove, a plurality of perforations —15— lead through the wall of the piston, and serve as an avenue of escape for oil that may accumulate beneath the lower ring during the down stroke of the piston. The floor of this groove, is suitably inclined to facilitate the operation of drilling the holes 15. The only portions of the apron of the piston (*i. e.*, that portion of the wall which depends below the pin) which bear efficiently against the walls of the cylinder are those, fore and aft, which lie in the plane of the movement of the connecting rod about the pin. The side portions (those below the ends of the pin) serve to steady the piston against lateral motion. I remove portions of said apron, leaving openings —16— each of which extends circumferentially approximately one third of the distance around the piston, and longitudinally from a point just below the oil groove to within a spaced distance of the lower end of the piston, leaving a band —18— of sufficient width to give a satisfactory bearing surface. Alined bearings —19— each of which has a suitable bore —20— for the reception of a piston pin, are attached at their outer ends to the band section at the upper edge of the openings —16—, centrally thereof. The inner end of each of the bearings is supported by a transverse bridge or truss —21— joined respectively, centrally to the bearings and terminally to the edges of the portions 17 of the apron of the piston.

It is thought that the many advantages

of a piston constructed in accordance with the foregoing description will be evident to those skilled in the art.

The walls may be considerable thinner than with the usual construction, as they are not subjected to lateral strain, the bearings being supported on the inner end by a bridge supported by the side walls, which gives great rigidity to them, offering a maximum resistance to the bending strain exerted by the pin. The removal of portions of the apron also serves to reduce the weight.

It is to be understood that applicant reserves the right to resort to such changes, modifications, and variations, as may properly come within the scope of the appended claims.

Having thus described my invention so that those skilled in the art may make and use the same,

I claim:

1. A piston comprising a head section and a depending apron having oppositely disposed openings therein, alined bearings the outer ends of which are suspended from said head section within said openings, and bridges sustaining the inner ends of said bearings.

2. A piston comprising a head section, and a depending cylindrical apron, said head section being provided with a plurality of grooves for the reception of rings, and an oil groove having perforations leading from its floor to the interior of the piston, said apron having an opening below said oil groove, a bearing the outer end of which is suspended from the head section at upper edge of said opening, and a transverse bar attached respectively to the inner end of said bearing and to the apron.

3. A piston, comprising a head, and a depending apron having an opening therein, a bearing the outer end of which is attached to the head at the upper edge of said opening, and a transverse bar adapted to support the inner end of said bearing.

VICTOR E. SCHMIEDEKNECHT.

PLAINTIFFS' EXHIBIT NO. 6.
U. S. Patent No. 1,402,309, Jan. 3, 1922,
To L. P. Moore.
Piston for Internal Combustion Motors.
(Filed January 27, 1934.)

1310

L. P. MOOERS.

PISTON FOR INTERNAL COMBUSTION MOTORS.

APPLICATION FILED JUNE 2, 1917.

1,402,309. Patented Jan. 3, 1922.

2 SHEETS—SHEET 1.

Fig. 1

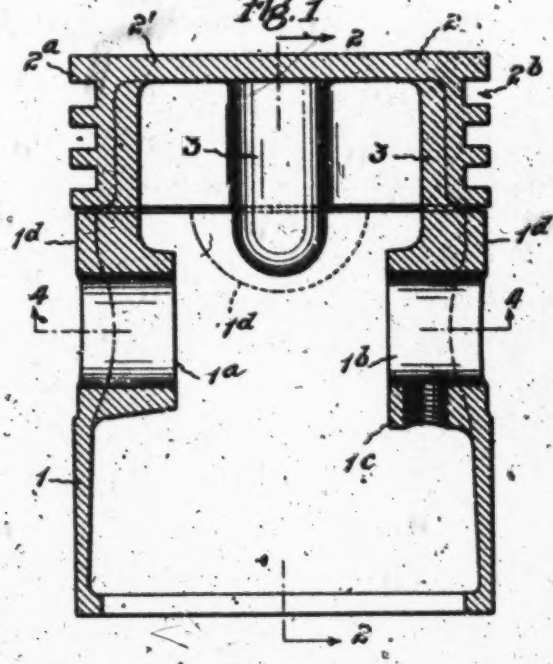


Fig. 2

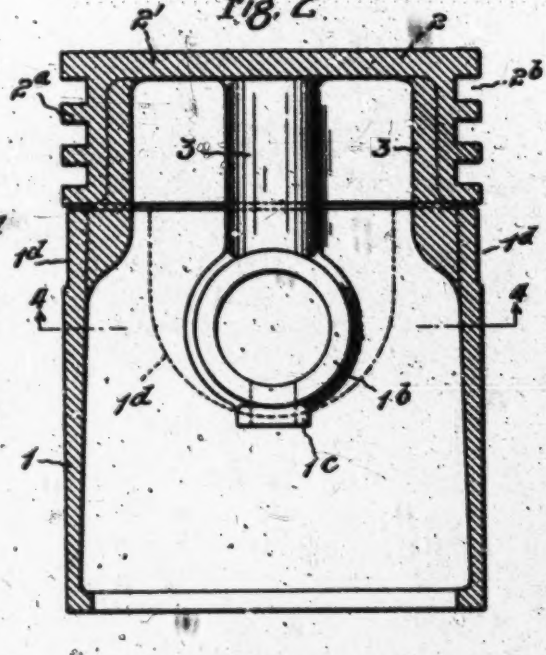


Fig. 3

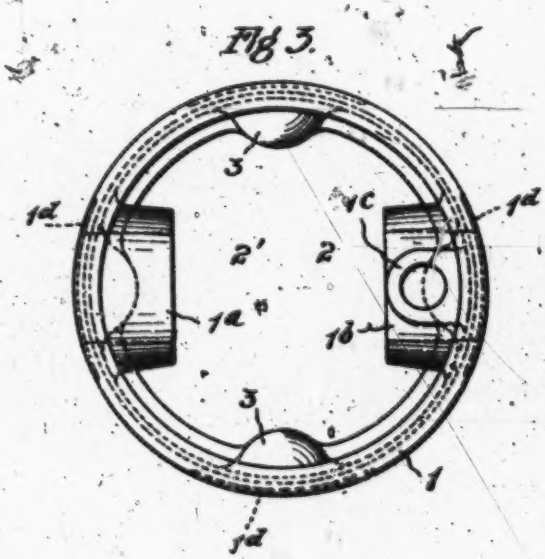
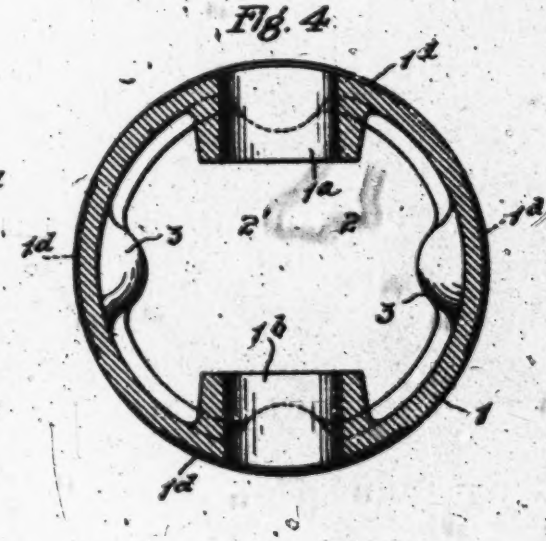


Fig. 4



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PISTON FOR INTERNAL COMBUSTION MOTORS.

APPLICATION FILED JUNE 2, 1917.

1,402,309.

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3 SHEETS—SHEET 2.

Fig. 5

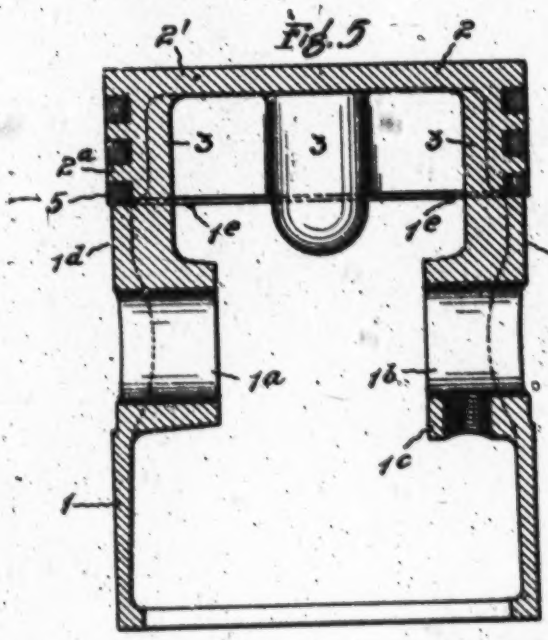


Fig. 6

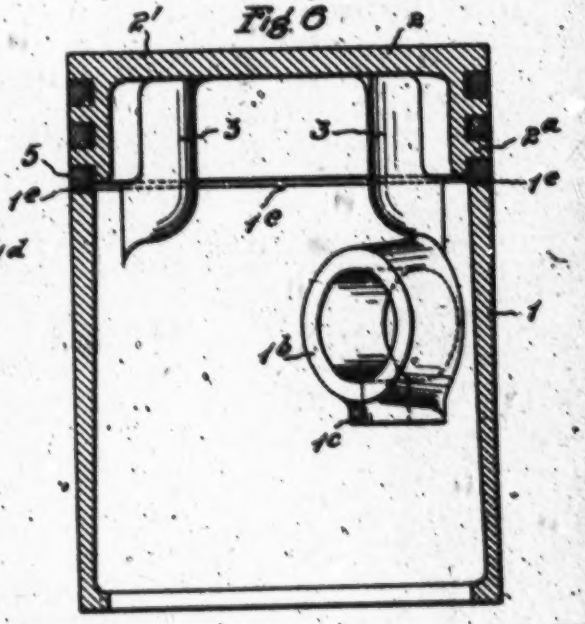


Fig. 7.

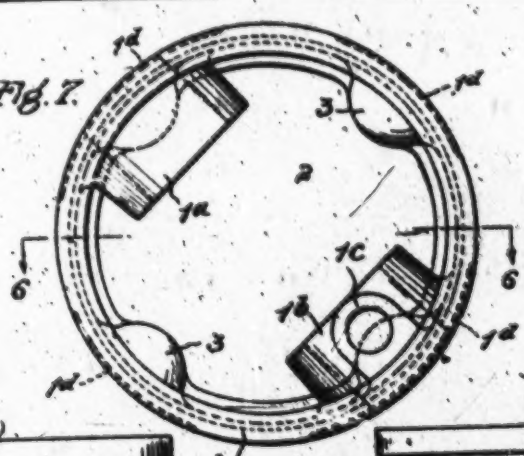


Fig. 8.

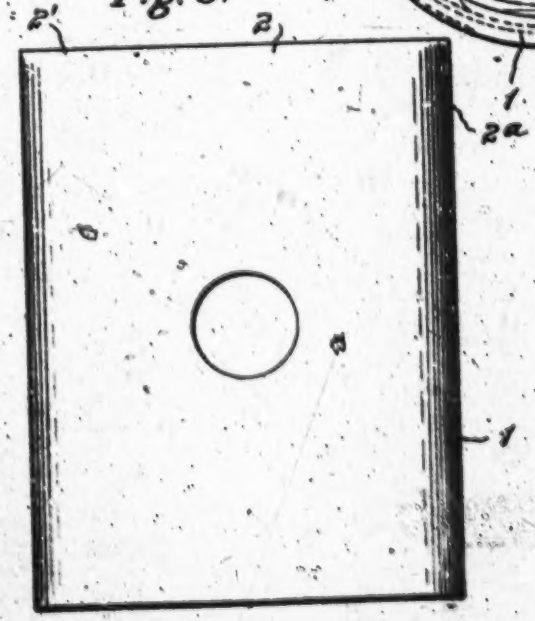
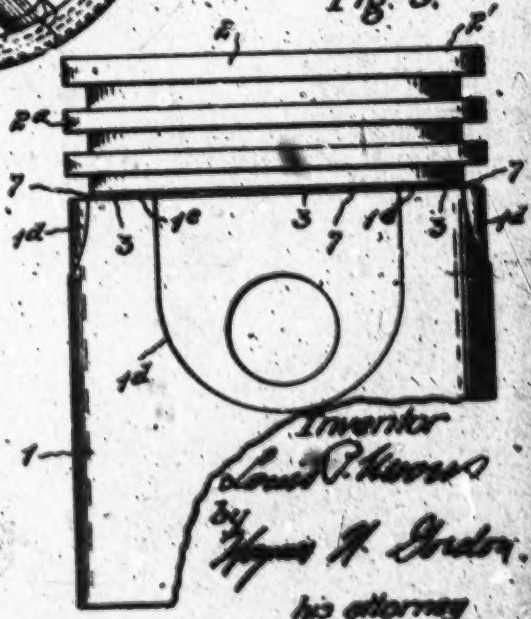


Fig. 9.



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L. P. MOOERS.

PISTON FOR INTERNAL COMBUSTION MOTORS.

APPLICATION FILED JUNE 2, 1917.

1,402,309.

Patented Jan. 3, 1922.

3 SHEETS—SHEET 1.

Fig. 10

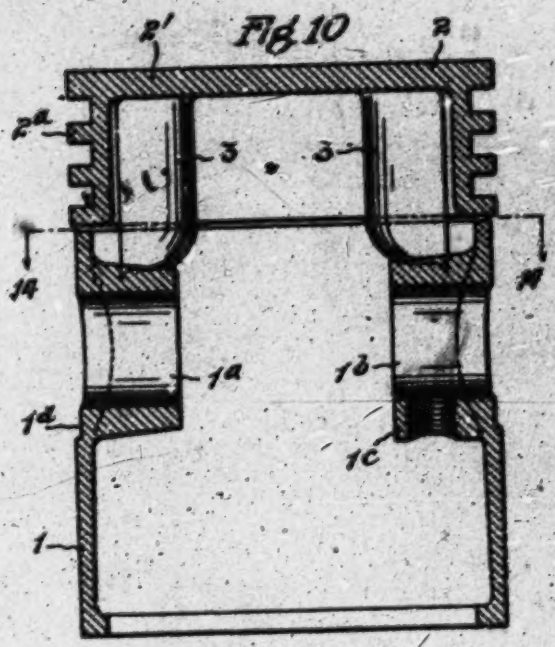


Fig. 11

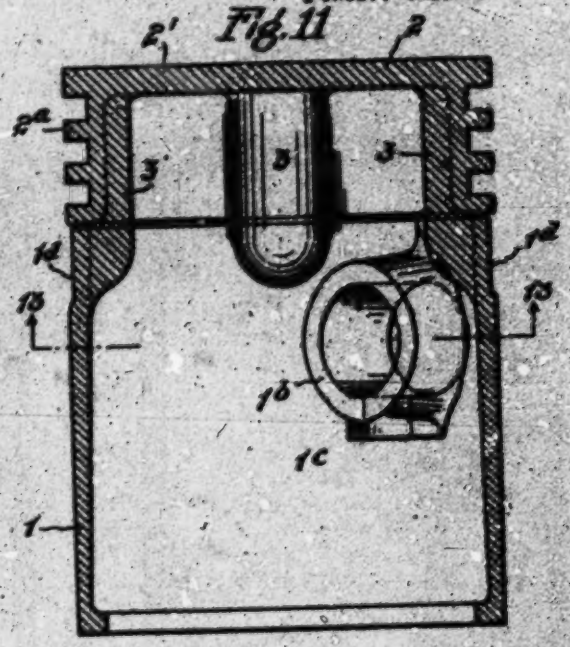


Fig. 12

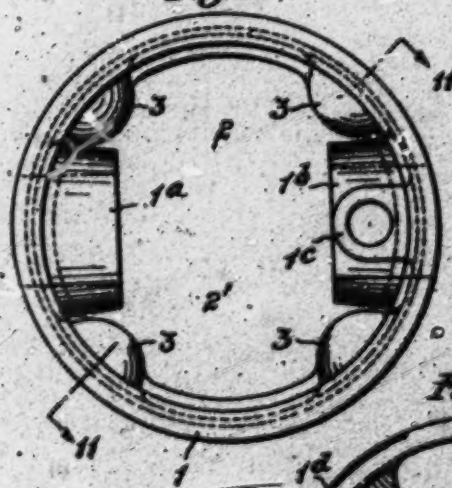
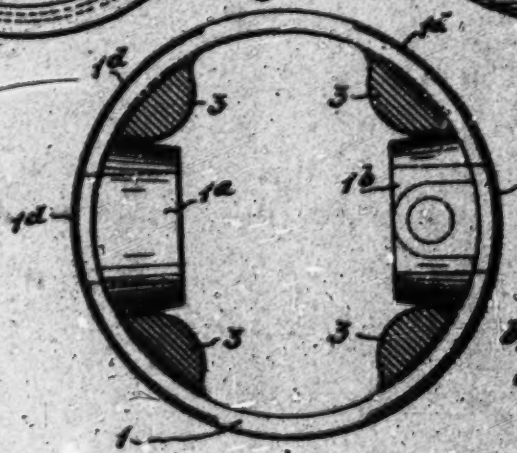


Fig. 13

Fig. 14



Inventor
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UNITED STATES PATENT OFFICE.

LOUIS P. MOOREA, OF CINCINNATI, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE CLEVELAND TRUCK COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

PISTON FOR INTERNAL-COMBUSTION ENGINES.

1,402,309. Specification of Letters Patent. Patented Jan. 3, 1922.

Application filed June 3, 1919. Serial No. 301,301.

To all whom it may concern:

Be it known that I, LOUIS P. MOOREA, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in and Relating to Pistons for Internal-Combustion Motors, of which the following is a specification.

The invention relates to improvements in pistons which are adapted especially for use in internal combustion motors.

One of the objects of my invention is to produce a simple, light, durable and efficient skirted piston peculiarly adapted to meet the conditions which exist in an internal combustion motor cylinder, including the stresses and strains imposed upon the piston, particularly during the explosion stroke, and by the high heat generated at this time, which must be efficiently and economically (1) utilized in the translation of heat into mechanical energy, and (2) that not translated into mechanical energy promptly dissipated.

My present invention comprises improvements on the joint invention of myself and Edward O. Spillman disclosed in [illegible] Patent of the United States No. [illegible].

It contemplates simplifying the construction and manufacture of pistons of this patented type and of considerably lightening the construction as compared with the integral cast structure illustrated in the said patent. It further contemplates the disposition of the parts which go to make up the piston relative to each other as in the piston embodying one form of this invention may be made readily in permanent molds.

It further contemplates the dissipating the heat from the head of the piston more effectively, as compared with the bosses, than is the case with the construction illustrated in the said Patent No. [illegible].

Other objects of my invention will be obvious to one skilled in the art from the description of one or more forms of the idea which I have herein disclosed for the purpose of [illegible] disclosure of my invention.

[illegible] master taken through the axis of the wrist pin bosses.

Fig. 2 is a section on the line 2—2, Fig. 1.

Fig. 3 is a bottom plan view looking into one of my improved pistons.

Fig. 4 is a section on the line 4—4, Fig. 1.

Fig. 5 is a longitudinal section taken through the axis of the wrist pin bosses of a modified form of piston embodying my invention.

Fig. 6 is a section on the line 6—6, Fig. 7.

Fig. 7 is a bottom plan view of the construction of piston illustrated in Fig. 5.

Fig. 8 is a side elevation of a piston casting after being taken from the mold and before any machining is done on it.

Fig. 9 is a side elevation of said piston casting after it has been externally machined and the slot made to provide the air gap between the head and the skirt portion of the piston.

Fig. 10 is a longitudinal section through the axis of the wrist pin bosses of another modified form of my invention.

Fig. 11 is a section on the line 11—11, Fig. 10.

Fig. 12 is a bottom plan view of the piston construction illustrated in Fig. 10.

Fig. 13 is a section on the line 13—13, Fig. 12.

Fig. 14 is a section on the line 14—14, Fig. 12.

In Figs. 1 to 4 inclusive, 1 is the skirt, body or guide portion of the piston, 2 is the top or piston head, and [illegible] connecting [illegible] with the skirt 1 and head 2 by connecting [illegible] 3 and 4. The [illegible] are cast integral with the skirt and head [illegible] and are [illegible] the axis of the piston [illegible] 5 is the wrist pin hole [illegible] 6 is the connecting rod [illegible] 7 is the wrist pin [illegible] 8 is the [illegible] 9 is the [illegible] 10 is the [illegible] 11 is the [illegible] 12 is the [illegible] 13 is the [illegible] 14 is the [illegible] 15 is the [illegible] 16 is the [illegible] 17 is the [illegible] 18 is the [illegible] 19 is the [illegible] 20 is the [illegible] 21 is the [illegible] 22 is the [illegible] 23 is the [illegible] 24 is the [illegible] 25 is the [illegible] 26 is the [illegible] 27 is the [illegible] 28 is the [illegible] 29 is the [illegible] 30 is the [illegible] 31 is the [illegible] 32 is the [illegible] 33 is the [illegible] 34 is the [illegible] 35 is the [illegible] 36 is the [illegible] 37 is the [illegible] 38 is the [illegible] 39 is the [illegible] 40 is the [illegible] 41 is the [illegible] 42 is the [illegible] 43 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The upper end of the guide section or skirt is separated from the head 2 by an air gap. In the drawings, purely for the purpose of illustration, this air gap is shown wider than is necessary. The presence of this air gap or air space between the upper edge of the skirt or body section 1 and the lower edge of the peripheral portion 2* of the piston head, insures that the heat absorbed by the piston head principally will be transmitted inwardly and downwardly through the columns 3 so that such portion of it as does reach the skirt or body by conduction will do so at points below said air gap and will be reduced in amount so as to reduce relatively the expansion of the skirt as compared with the head, thereby permitting the skirt to be fitted relatively closely to the inner walls of the cylinder. While this air gap, as above indicated has been shown, for the purpose of illustration, wider than necessary, it will be understood that my invention contemplates any sort of a separated relationship between the upper end of the skirt and the adjacent head 2 because of which heat will not be transmitted efficiently or readily from the head to the skirt other than through a connector or connectors which join those two parts of the piston together. It will be understood that this relationship might be that of a poor mechanical fit or joint which would be a poor conductor of heat, as compared with the metal of the head 2 and connectors 3, so that such heat as did pass from the head 2 to the skirt 1 would do so principally by way of the connectors 3, rather than from the head to the upper end of the skirt 1 directly.

A piston of my improved construction may be made unusually light, durable and efficient by forming it of an integral casting of a metallic alloy having a relatively low specific gravity, such for example as an alloy of aluminum, copper and magnesium, or any other metallic alloy of aluminum or other low specific gravity metal known by those skilled in the art to be suitable for the construction of cast, skirted pistons. As the alloys of metals of relatively low specific gravity, suitable for such purposes, have relatively high coefficients of expansion, some difficulty has been experienced with the use of pistons made of them in internal combustion motors, due to the necessary clearance between the piston walls and the cylinder walls to allow for such expansion; as the result of which clearance, both "piston slapping" and "oil pumping" are likely to result, as is well known to those skilled in the art. Furthermore, liquid hydro-carbons are likely to escape past the piston into the crank case and thin down the lubricant below to an undesirable degree.

It will be understood that with a piston constructed in accordance with my invention, the sleeve or skirt 1 may be constructed so as relatively snugly to fit the inner walls of the motor cylinder, whereas the head 2 may be given a considerable amount of clearance between its outer surface and the inner wall of the cylinder to allow for all necessary expansion of the head due to the high temperatures to which it is directly subjected. The fit between the skirt and the inner wall of the cylinder may be a snug sliding fit and the area of the skirt which co-acts with the inner wall of the cylinder be such as to insure against slapping or rapping of the piston against the inner wall of the cylinder. In fact objectionable piston slap, incident to the operation of numerous types of pistons, for use in internal combustion motors, substantially is eliminated, by the use of a piston constructed in accordance with my invention. Likewise oil pumping is substantially eliminated and the passage of liquid hydrocarbons from the top of the piston to the crank case is practically eliminated, resulting in minimizing of undue and troublesome carbonization and undesirable smoking among other things.

Due to the fact that the skirt or sleeve 1 is maintained relatively cool under all normal conditions, the possibilities of scoring of the inner walls of the cylinder are practically eliminated.

The construction of a piston embodying my improvements, as hereinbefore described, may be readily carried out in permanent molds, which is not true of the construction illustrated in said Letters Patent No. 1,092,870, and I have had in mind the use of such permanent molds in the design of my said improvements.

The exterior walls of the skirt near the upper end thereof, where the connectors 3 join the skirt, may be relieved or recessed, as indicated at 1*, to allow for greater expansion at these points than will occur at other points in the same circumference of the skirt.

In the modification of my invention, illustrated in Figs. 5 to 7, inclusive, the lower piston ring groove is formed by the walls of a recess in the peripheral flange 2* of the piston head 2 and the upper end wall of the skirt 1. In this case the lower piston ring 5 may be used as and will operate as an oil wiper and will permit the oil to pass underneath it through the groove 1* in the upper end wall of the skirt 1 and leak into the crank case, thus assisting in keeping the motor from smoking. Where the piston rings are mounted as illustrated in Figs. 1 and 2, the air gap between the upper end of the skirt and the adjacent wall of the peripheral flange of the piston head will serve to provide an escape for oil past the

case from the cylinder walls and substantially eliminate undesirable smoking of the motor.

In the modified construction illustrated in Figs. 10 to 14, inclusive, all of the column or connectors 3 are disposed out of alignment with the wrist pin bosses 12. When thus disposed the amount of heat transmitted through such connectors to the wrist pin bosses will be somewhat reduced over that of a piston having the construction illustrated in Figs. 1 to 6, inclusive, as none of such connectors will transmit heat directly to either of the wrist pin bosses, there being a section of skirt between the connection of the lower end of each such connector with the skirt and the connection of the adjacent wrist pin boss with the skirt. Furthermore, with this last referred to modification the relief spaces or recesses in the outer wall of the piston adjacent the points at which the connectors 3 join the skirt will be so disposed as not to reduce any of the principal wearing surfaces of the piston against the inner wall of the cylinder.

In addition, with all the connectors 3 disposed in the regions of the pin bosses, as disclosed in Figs. 10 to 14, inclusive, the piston is especially well adapted to run with a close fit of the guide section 1 in the cylinder. It will be observed, on reference to Figs. 10, 13 and 14, that said guide section has a circumferential seam or bolt extending from the upper end down to and below the pin boss openings that is characterized by a short outer diameter on line with the bosses and a long outer diameter at right angles to said bosses, this being due to the above described relief of the piston adjacent the bosses and the connectors 3. Thus when this top zone of the guide bears up the resulting expansion can be accommodated by outward movement of the relieved part of the wall and danger of seizing as a result of close engagement between the unrelieved part of said wall and the cylinder is obviated. This action, of course, is made possible by the fact that the upper end of the guide section is not continuously joined to the head section but being connected to the head by the ribs 20, is free to flex or form in a manner independent of the head. The bottom part of the guide section does not attain as high a temperature as said upper zone so that no special provision for the expansion of said lower part is necessary.

It will [illegible] any [illegible] light in [illegible] tage in [illegible] the [illegible]

Pistons [illegible] be found [illegible] lently, smoothly and efficiently [illegible] cylinders of internal combustion engines and with greatly reduced skirt clearance over ordinary constructions of skirted pistons.

In making my improved pistons, I prefer to employ the following process. The casting may be formed in any suitable mold as a [illegible] While the invention is not limited to any particular method of casting it is to be observed that the improved construction is especially well adapted for casting in a permanent mold, the form and arrangement of the connectors 3 relative to the inner piston walls and the absence of any obstruction that would prevent free access to said inner walls from the open end of the piston, obviating all difficulties that exist in casting. The casting being made, by outer surface may be suitably machined or ground so as to leave the general external form illustrated in Fig. 9, or in Figs. 13, 13 and 14, and thereafter the head 6, including said wall 9 and peripheral wall 10, may be separated from the skirt 11 by inserting a cutting tool at 7, so as to form the air gap between the lower end wall of the peripheral flange 10 of the head and the upper end wall of the skirt. This separation of the head from the skirt may be effected before externally surfacing the casting, if desired. Any well known type of cutting mechanism may be employed for the purpose. After the cut 7 inside the exterior of the casting will have the general appearance illustrated in Fig. 8.

To those skilled in the art of making [illegible] of the cloth [illegible] many [illegible] sections of construction and widely different [illegible] of any explanation will suggest themselves without departing from the spirit and scope thereof. My disclosures and the descriptions herein are purely illustrative and are not intended to be in any sense limiting.

What I claim is:

1. An integrally cast piston [illegible] a skirt section having [illegible] and peripheral walls, a [illegible] separated at the upper edge from the lower edge of the peripheral wall of said head section by an air gap and [illegible] pin bosses and [illegible] which [illegible] and [illegible] the [illegible] of the [illegible] and [illegible] of the [illegible] and [illegible] walls of the [illegible]

eral wall of the head section across said air gap to the upper part of the guide section in the regions of said wrist pin bosses, the wall of said guide section being exteriorly relieved opposite said connectors.

3. A piston comprising a head section having end and peripheral walls, a guide section provided with diametrically opposite wrist pin bosses, and means connecting the head and guide sections in the regions of said bosses, the upper edge of the guide section and the lower edge of the head being separated by an air gap in the regions between said connecting means, and the guide section being exteriorly relieved in the regions of the bosses and connecting means.

4. An integrally cast piston comprising a head section having end and peripheral walls, a guide section provided with diametrically opposite wrist pin bosses, and means connecting the head and guide sections in the regions of said bosses, the upper edge of the guide section and the lower edge of the head being separated by an air gap in the regions between said connecting means and the guide section being exteriorly relieved in the regions of the bosses and connecting means.

5. A piston for an internal combustion engine comprising a guide section having a pair of diametrically opposed wrist pin bosses integrally formed therewith, a head having end and peripheral walls the lower edge of the latter being spaced from the upper edge of said guide section by a practically continuous non-conducting air gap, and connectors which extend from said peripheral wall downwardly to said guide section and are integrally formed with said peripheral wall and guide section, said guide section being exteriorly relieved in the regions of said connecting means.

6. An integral cast piston for an internal combustion engine comprising a guide section having a pair of diametrically opposed wrist pin bosses, a head section having end and peripheral walls, the lower edge of the latter being separated from the upper edge of said guide section by a relatively narrow air gap extending practically around the piston, and connectors which spring from said peripheral wall of said head and the upper end of said guide section and bridge said air gap, there being no cored-out space between any of said connectors and the adjacent side walls of the head and guide sections and said guide section being exteriorly relieved in the regions of said connecting means.

7. An integral cast piston for an internal combustion engine comprising a guide section having a pair of diametrically opposed wrist pin bosses, a head section having end and peripheral walls, the lower edge of the latter being separated from the upper edge of said guide section by a relatively narrow air gap extending practically around the piston, and connectors which spring from said peripheral wall of said head and the upper end of said guide section in the regions of said wrist pin bosses and bridge said air gap, said guide section being exteriorly relieved over continuous areas each embracing the region of one of said bosses and the adjacent connecting means.

8. A piston for an internal combustion motor, comprising a guide section having a pair of diametrically opposed wrist pin bosses integrally formed with the guide section, a head having end and peripheral walls, the lower edge of the latter being separated from the upper edge of the guide section by an air gap, and means disposed out of alignment with the axes of said wrist pin bosses and extending across said air gap and providing the sole means of connection between said head and guide section.

9. A piston for an internal combustion motor, comprising a guide section having a pair of diametrically opposed wrist pin bosses integrally formed with the guide section, a head having end and peripheral walls, the lower edge of the latter being separated from the upper edge of the guide section by an air gap, and connectors between the peripheral wall of said head and the guide section formed integral therewith and radially inset with respect to said peripheral wall and providing the sole means of connection between said head and guide section.

10. An integrally cast piston comprising a head section having end and peripheral walls, a guide section separated at its upper edge from the lower edge of the peripheral wall of said head section by an air gap and provided with diametrically opposed wrist pin bosses and section connectors between the head section and the guide section in the regions of said wrist pin bosses, said connectors being disposed radially inside the air gap and there being no cored-out space between any of said connectors and the adjacent side walls of the head and guide sections.

11. An integrally cast piston comprising a head section having an end wall and a peripheral wall formed with a plurality of ring grooves, a guide section provided with diametrically opposite wrist pin bosses, and means connecting the head and guide sections in the regions of said bosses, the upper edge of the guide section and the lower edge of the head being separated in the regions between said connecting means by air gaps disposed below the lowermost of said ring grooves and the guide section being exteriorly relieved in the regions of the bosses and connecting means.

12. An integrally cast piston comprising

a head section having end and peripheral walls, a guide section communicable therewith comfortably and provided with diametrically opposite orbit pin means and means connecting the head and guide sections in the region of said means, the upper edge of the guide section and the lower edge of the head being separated by an air gap in the region between said connecting means and the guide section being similarly separated in the region of the former said connecting means.

In testimony whereof I affix my signature, in the presence of two witnesses.

LOUIS P. MOORES.

Witnesses:

STANLEY ZOLTOWSKI,

JOHN M. WATSON.

PLAINTIFFS' EXHIBITS.

STIPULATED DIGEST OF ASSIGNMENTS OF PATENTS IN SUIT.

GULICK PATENT NO. 1,315,733 (PLAINTIFFS' EXHIBIT 2)

Plaintiffs' Exhibit 2-A

From Edward J. Gulick to Packard Motor Car Company
Interest: Entire
Consideration: Five Dollars
Dated: November 23, 1917

Plaintiffs' Exhibit 2-B

From Packard Motor Car Company to The Cleveland Trust Company
Interest: Entire
Consideration: "Good and valuable"
Dated: September 11, 1922

JARDINE PATENT NO. 1,763,523 (PLAINTIFFS' EXHIBIT 3)

Plaintiffs' Exhibit 3-A

From Frank Jardine to The Aluminum Castings Co.
Interest: Entire
Consideration: One Dollar and Other
Date: March 9, 1920

Plaintiffs' Exhibit 3-B

From The Aluminum Castings Company to Aluminum Manufactures, Incorporated
Interest: Entire in Jardine application S. N. 364,997
Consideration: One Dollar and Other
Date: August 1, 1921

Plaintiffs' Exhibit 3-C

From Aluminum Manufactures, Inc. to Aluminum Company of America
Interest: Entire in Jardine application S. N. 364,997
Consideration: One Dollar and Other
Date: July 1, 1924

Plaintiffs' Exhibit 3-D

From Aluminum Company of America to The Cleveland Trust Company, as Trustee
Interest: All assignor owns in Jardine application S.N. 450,898 filed March 9, 1921 (renewal of S.N. 364,997)
Consideration: Pursuant to agreement of April 26, 1924
Date: May 13, 1930

MAYNARD PATENT NO. 1,655,968 (PLAINTIFFS' EXHIBIT 4)

Plaintiffs' Exhibit 4-A

From Howard E. Maynard to Chrysler Corporation
Interest: Entire
Consideration: One Dollar
Date: December 18, 1926

Plaintiffs' Exhibit 4-B

From Chrysler Corporation to Aluminum Manufactures, Inc.
Interest: One-half of the entire
Consideration: One Dollar and Other
Date: December 27, 1926

Plaintiffs' Exhibit 4-C

From Aluminum Manufactures, Incorporated to Aluminum Company of America
Interest: One-half of the entire
Consideration: One Dollar and Other
Date: February 17, 1927

Plaintiffs' Exhibit 4-D

From Aluminum Company of America to The Cleveland Trust Company
Interest: All that Aluminum Company of America Owns.
Consideration: Pursuant license agreement and further considerations.
Date: February 23, 1928

SCHMIEDEKNECHT PATENT NO. 1,256,265
(PLAINTIFFS' EXHIBIT 5)

Plaintiffs' Exhibit 5-A

From Victor E. Schmiedeknecht to Frank J. Kent
Interest: Entire
Consideration: Ten Dollars and Other
Date: August 10, 1927

Plaintiffs' Exhibit 5-B

Warranty and Guaranty by Victor E. Schmiedeknecht
Date: August 13, 1927

Plaintiffs' Exhibit 5-C

From Frank J. Kent to Bohn Aluminum and Brass Corp.
Interest: Entire
Consideration: One Dollar and Other
Date: October 12, 1927

Plaintiffs' Exhibit 5-D

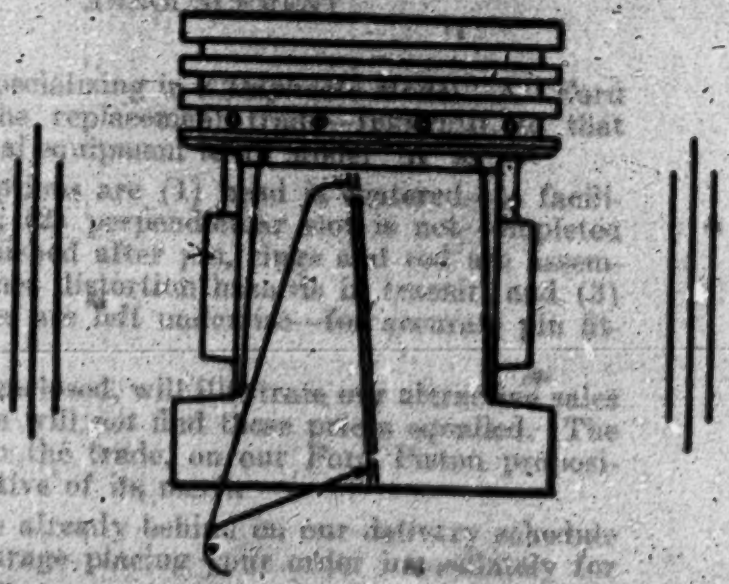
From Bohn Aluminum & Brass Corporation to The Cleveland Trust Company
Interest: Entire
Consideration: One Dollar
Date: October 31, 1927

FILED
JAN 27 1934
At ..... O'Clock ..... M.
F. J. DENZLER, Clerk
U. S. District Court N. D. O.

Plaintiff's Exhibit C. 30

CAUTION

Pl. 7



Complete (saw thru at arrows) after wrist pin, rings, and rod are assembled—just before installing.

This slot is left unfinished so as to reduce distortion hazards in transit.

Sterling Products Corporation

Saint Louis, U. S. A.

Printed in U. S. A.

PLAINTIFF'S EXHIBIT NO. 7.
Instruction Sheet to Purchasers of Exhibit No. 1.
(Filed January 27, 1934.)

1326

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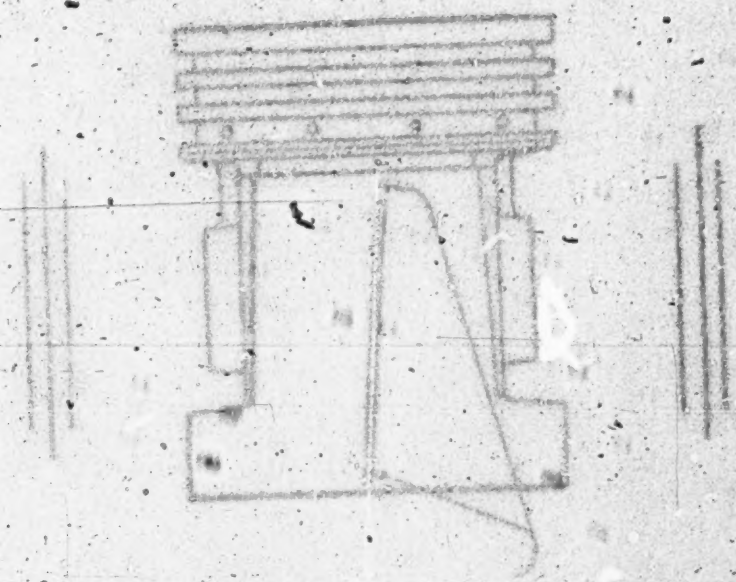
Plaintiff's Exhibit C.

CAUTION



Complete (see illus at arrows) after wrist pin, rings, and rod are assembled—just before installing.

This slot is left unfinished so as to reduce distortion hazards in transit.

Sterling Products Corporation
Saint Louis, U. S. A.

Printed in U. S. A.

PLAINTIFF'S EXHIBIT NO. 7
Instruction Sheet to Purchasers of Bayer-Aspirin
Filed January 27, 1939.

PLAINTIFFS' EXHIBIT NO. 11.

Circular Letter of Sterling Products Corporation.

(Filed January 27, 1934.)

STERLING PRODUCTS CORPORATION
2916 North Market St.
Saint Louis

ANNOUNCEMENT

Gentlemen:

We are specializing in a *Duplicate* Model "A" Ford Piston, for the replacement trade—Identical to that used as original equipment to all Model "A"s.

The exceptions are (1) head is centered—to facilitate finishing; (2) perpendicular slot is not completed (this to be finished after pin, rings and rod are assembled)—to reduce distortion hazards in transit; and (3) wrist pin holes are left undersize—for accurate pin fitting.

Bulletin, enclosed, will illustrate our attractive sales schedule. You will *not* find these prices equalled. The response, from the trade, on our Ford Piston proposition, is indicative of its merit.

As we are already behind on our delivery schedule —would encourage placing your order immediately for future delivery.

Yours very truly,

Sterling Products Corporation.

(Received Jun 13 1930 Evans & McCoy.)

PLANTIFFS' EXHIBIT NO. 13.

Tabulation as to Sales Produced by Whitney.

(Filed January 27, 1934.)

SUMMARY OF ROYALTIES PAID BY LICENSEES UNDER THE PISTON PATENT ESTATE

Year 1924	$ 23,353.08
1925	57,753.92
1926	51,284.82
1927	58,240.29
1928	209,810.43
1929	207,861.12
1930	141,982.96
1931	93,219.67
1932 (three quarters)	60,470.80
	$903,977.09

SUMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1925 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

Licensee	Total Production		Net Sales		Royalties Paid
Aluminum Co. of America	831,682		815,374		
	25,349		25,251		
	1,158,464		1,108,331		
	59,443		58,775		
	1,199,988		1,176,367		
	24,313		23,670		
	900,380		874,545		
	32,489	4,232,108	32,164	4,114,477	41,144.77
Kant-Skore Piston Co.	79,540		65,929		
	121,361		117,991		
	170,393		159,541		
	165,808	537,102	163,619	497,080	4,970.80
W. M. Levett Co., W. M. Levett Corporation and W. M. Levett	251,929		248,107		
	354,769		339,646		
	314,454		303,176		
	288,344	1,209,496	272,906	1,163,835	11,638.35
National Piston Company	0		0		
	0		0		
	0		0		
	0		0		
		5,978,706		5,775,392	57,753.92

SUMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1926 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

Licensee	Total Production		Net Sales		Royalties Paid
Aluminum Co. of America	1,361,988		1,351,133		
	21,844		21,715		
	913,469		900,879		
	63,306		62,813		
	777,690		772,643		
	1,709		1,675		
	553,930		550,216		
	3,312	3,697,248	3,299	3,664,373	36,643.73
The Kant-Skore Piston Co.	353,178		344,218		
	355,372		341,827		
	164,778		161,849		
	129,953	1,003,281	119,610	967,504	9,675.04
Walker M. Levett Co., W. M. Levett Corporation and W. M. Levett	205,761		202,685		
	51,684		49,964		
	29,223		25,601		
	96,129	382,797	93,813	372,063	3,720.63
The National Piston Company, Inc.	10,379		10,379		
	41,622		41,622		
	48,289		46,445		
	36,658	136,948	26,096	124,542	1,245.42
		5,220,274		5,128,482	51,284.82

Plaintiffs' Exhibit No. 13

SUMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1927 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

Licensee	Total Production		Net Sales		Royalties Paid
The Aluminum Co. of America	953,859		947,692		
	308*		303*		
	1,133,980		1,112,035		
	1,681		1,681		
	974,468		953,190		
	750		747		
	792,434	3,856,866	770,474	3,785,516	37,855.16
The Kant-Skore Piston Company	186,683		179,069		
	144,695		141,836		
	68,474		66,397		
	69,168	469,020	64,484	451,806	4,518.06
Walker M. Levett Co., W. M. Levett Corporation and W. M. Levett	108,066		103,903		
	98,217		95,656		
	59,097		54,852		
	0	265,380	0	254,410	2,544.10
The National Piston Company, Inc.	8,326		5,435		
	0		80*		
	0		0		
	0	8,326	0	5,355	53.55
Bohn Aluminum and Brass Corporation	172,268		169,152		
	1,188,278	1,360,546	1,157,790	1,326,942	13,269.42
		5,960,138		5,824,029	58,240.29

* Figures in red.

SUMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1928 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

Licensee	Total Production		Net Sales		Royalties Paid
Aluminum Co. of America	2,243,764		2,218,170		
	1,500		1,500		
	2,711,053		2,661,563		
	2,170		2,170		
	2,431,813		2,409,107		
	1,654,463		1,629,899		
	9,044,768		8,922,209		89,222.09
The Kant-Skore Piston Company	217,279		212,905		
	350,283		338,833		
	242,988		236,348		
	152,782		141,890		
	963,432		929,976		9,299.76
Bohn Aluminum and Brass Corporation	2,662,916		2,602,739		
	2,913,717		2,947,534		
	3,300,579		3,217,904		
	2,523,961		2,460,381		
	11,401,173		11,128,558		111,285.58
		21,409,373		20,981,043	209,810.43

UMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1929 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

Licensee.	Total Production	Net Sales	Royalties Paid
luminum Company of merica	2,325,994	2,317,294	
	2,488,086	2,473,737	
	1,849,879	1,832,064	
	985,713	958,032	
	7,649,672	7,581,127	75,811.27
uminum Industries, Inc.	384,196	373,429	
	664,521	655 042	
	556,408	541,319	
	212,137	206,322	
	509,684	497,925	
	2,326,946	2,274,037	22,749.37
hn Aluminum and Brass rporation	3,576,703	3,521,867	
	3,663,724	3,583,220	
	2,872,192	2,803,411	
	1,062,812*	1,022,450	
	11,175,431	10,930,948	109,309.48
	21,152,049	20,786,112	207,861.12

UMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1930 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

Licensee	Total Production	Net Sales	Royalties Paid
minum Co. of America	1,348,244	1,341,775	
	1,572,819	1,565,050	
	603,817	596,212	
	1,109,188	1,104,496	46,095.33
	4,634,068	4,609,533	
minum Industries, Inc.	685,199	682,614	
	986,784	970,420	
	642,541	632,654	
	469,174	458,422	
	2,783,698	2,722,510	27,225.10
n Aluminum & Brass poration	2,764,209	2,731,263	
	2,475,617	2,444,823	
	1,694,161	1,063,468	
	844,565	825,699	
	6,978,552	6,865,253	68,652.53
	14,396,318	14,196,296	141,962.96

SUMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1931 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

Licensee	Total Production	Net Sales	Royalties Paid
Aluminum Company of America	973,900	970,735	
	1,024,002	1,020,669	
	262,177	257,898	
	255,167	249,413	
	2,515,246	2,498,625	24,986.25
Aluminum Industries, Inc.	377,635	366,992	
	516,246	519,091	
	480,228	472,947	
	255,495	242,733	
	1,629,604	1,592,763	15,927.63
Bohn Aluminum & Brass Corp.	1,631,388	1,608,218	
	2,263,589	2,236,588	
	791,060	753,183	
	648,418	632,590	
	6,334,455	5,230,579	52,305.79
	9,479,305	9,321,967	93,219.67

SUMMARY OF PISTONS MADE AND SOLD FOR THE FIRST THREE QUARTERS OF THE YEAR 1932 PISTON PATENT ESTATE

Licensee	Total Production		Net Sales		Royalties Paid
Aluminum Company of America	578,158		567,372		
	844,687		837,296		
	700,000	2,122,845	694,795	2,099,463	20,994.63
Aluminum Industries, Inc.	333,445		329,260		
	415,332		403,897		
	208,687	957,464	198,890	932,047	9,320.47
Bohn Aluminum & Brass Corporation	900,970		884,851		
	1,119,703		1,106,078		
	1,035,011	3,055,684	1,024,641	3,015,570	30,155.70
		6,135,993		6,047,080	$60,470.80

FILED
JAN 27 1934
P. J. DENZLER, Clerk
U. S. District Court, N. D. O.

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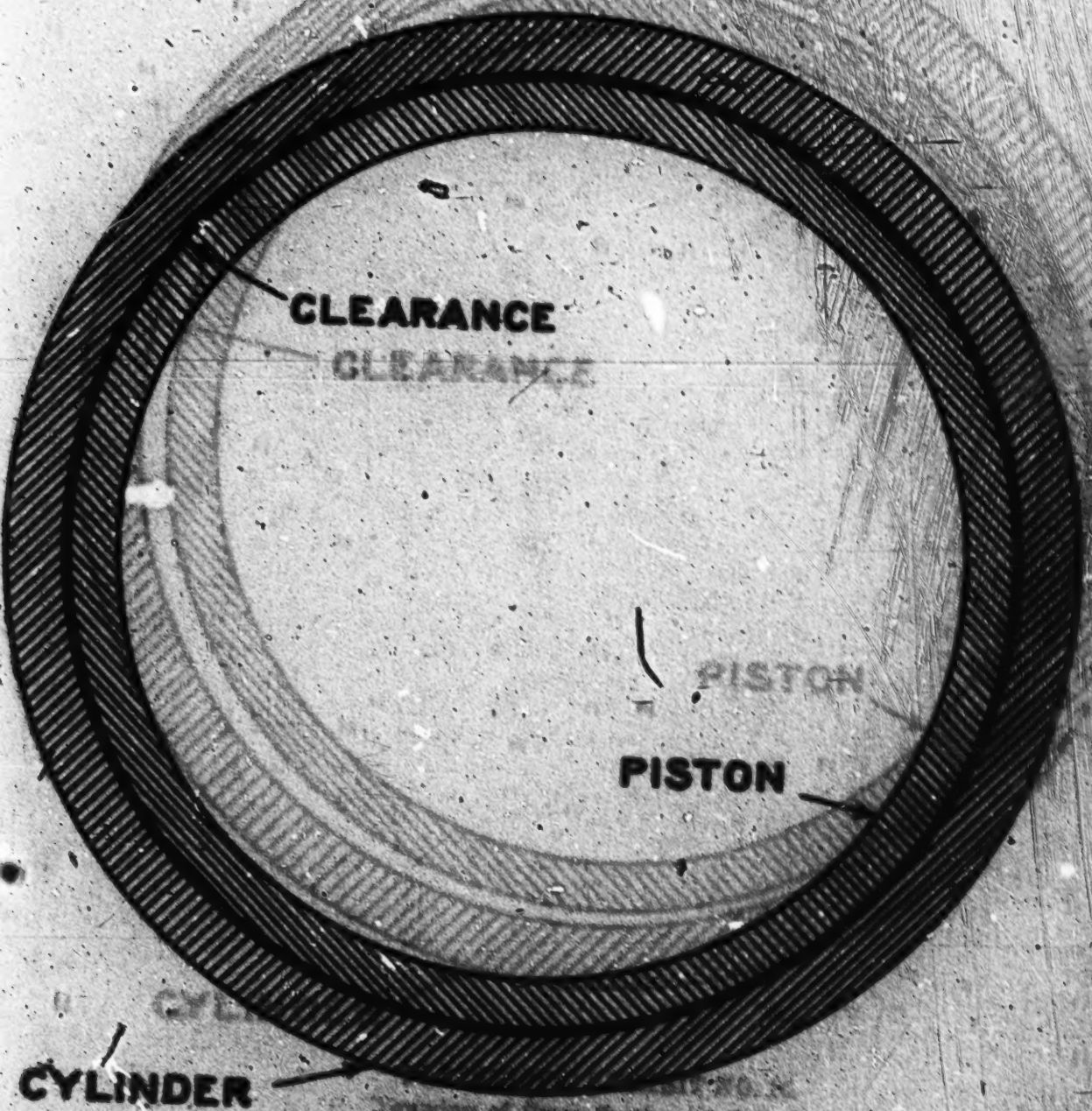
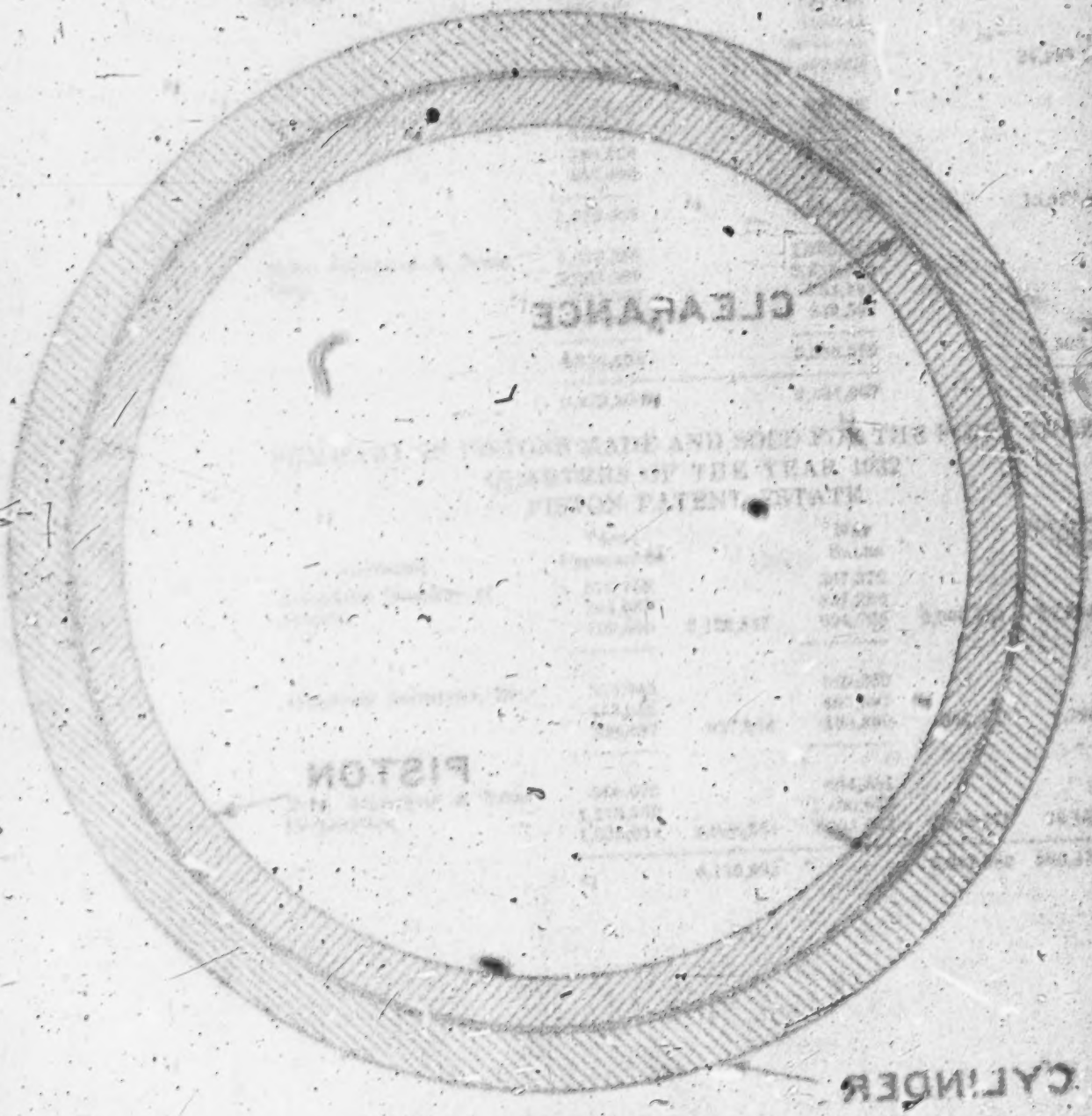
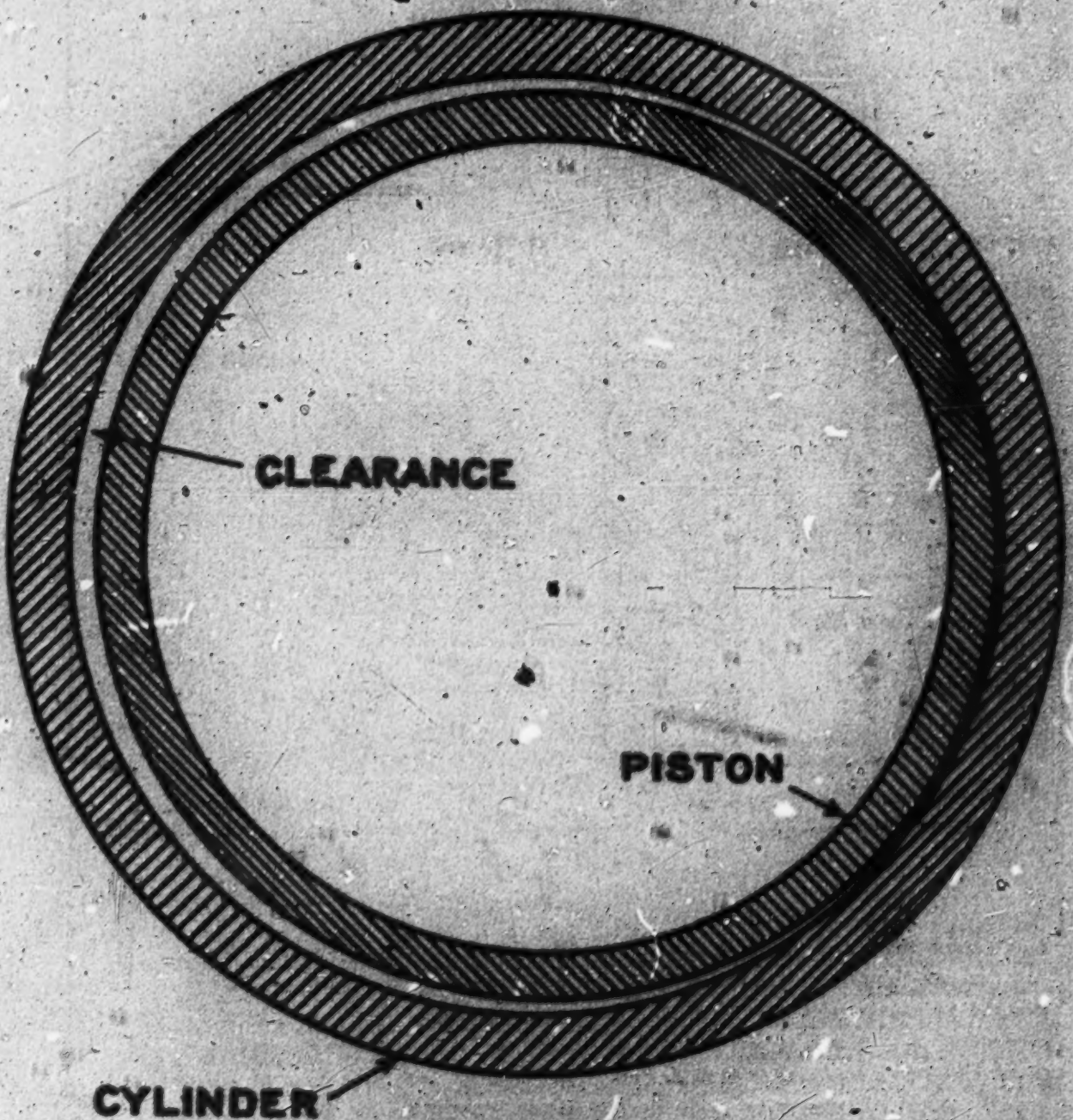


PLAINTIFFS' EXHIBIT NO. 15.
Drawing of Cross Section of Cylinder and Piston Wall.
(Filed January 27, 1934.)


CLEARANCE
PISTON
CYLINDER

FILED
JAN 27 1934
At ____ o'clock ____ M.
P. J. BENZLER, Clerk
U. S. District Court, N. D. O.

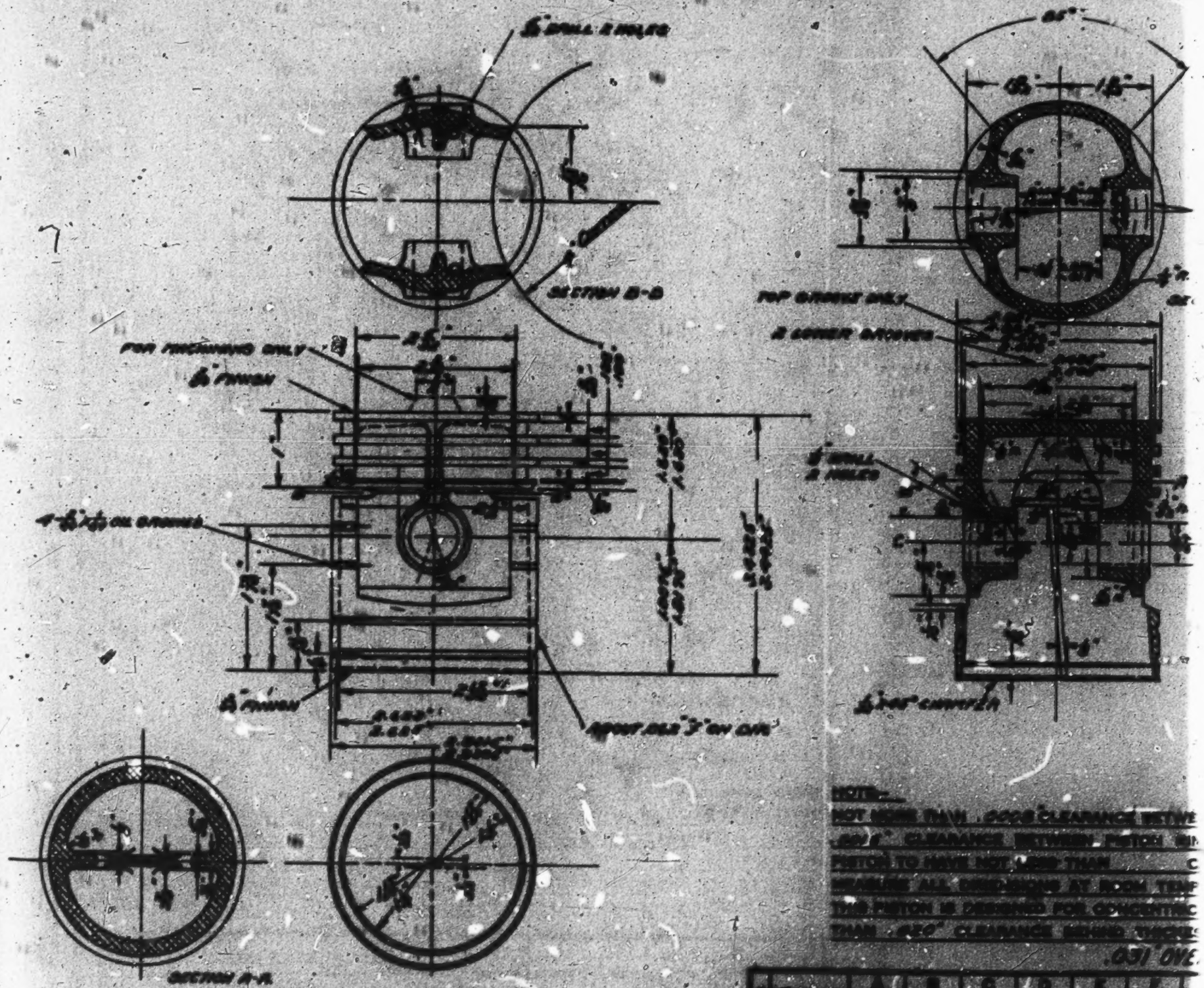


PLAINTIFFS' EXHIBIT NO. 14.
Drawing of Cross Section of Cylinder and Piston Wall (Magnified).
(Filed January 27, 1934.)

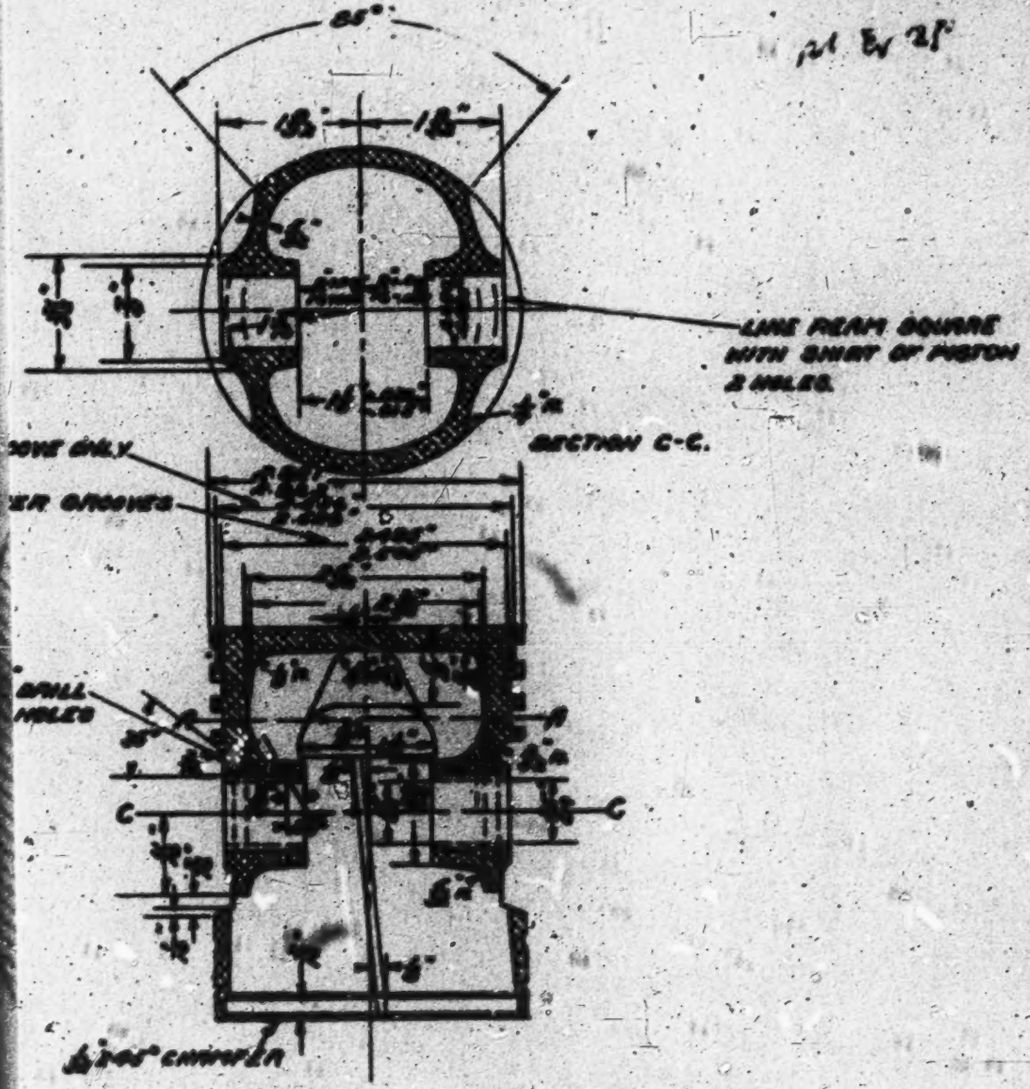
1336

FILED
JAN 17 1921

PLAIN TYPE RESULT NO. 16
Showing a Clean Section of Cylinder
and Plain Wall (Magnified).
(Filed January 17, 1921.)



PLAINTIFFS' EXHIBIT NO. 11.
Blueprint D-51XX, of Defendants' 5.0 Engine.
(Filed January 27, 1954.)



NOTE—

NOT MORE THAN .0005" CLEARANCE BETWEEN WRIST PIN AND PISTON BOSS.

.004" CLEARANCE BETWEEN PISTON RING AND RING GROOVE WALL.

PISTON TO HAVE NOT LESS THAN _____ CLEARANCE WHEN IN CYLINDER.

MEASURE ALL DIMENSIONS AT ROOM TEMPERATURE OR 70° FAHRENHEIT.

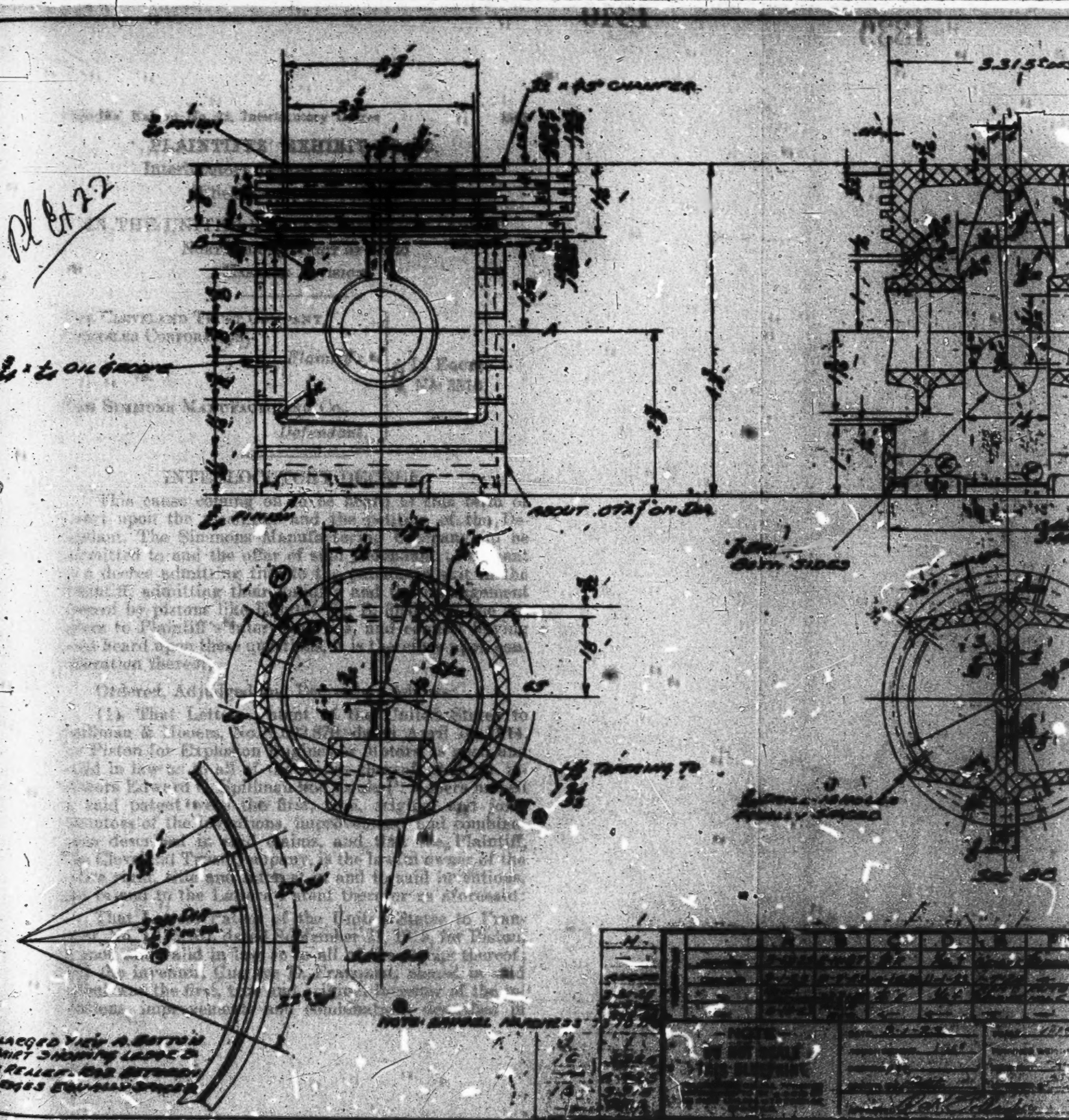
THIS PISTON IS DESIGNED FOR CONCENTRIC RINGS. DO NOT ALLOW MORE THAN .020" CLEARANCE BEHIND THICKEST PORTION OF PISTON RING.

.031 OVERSIZE

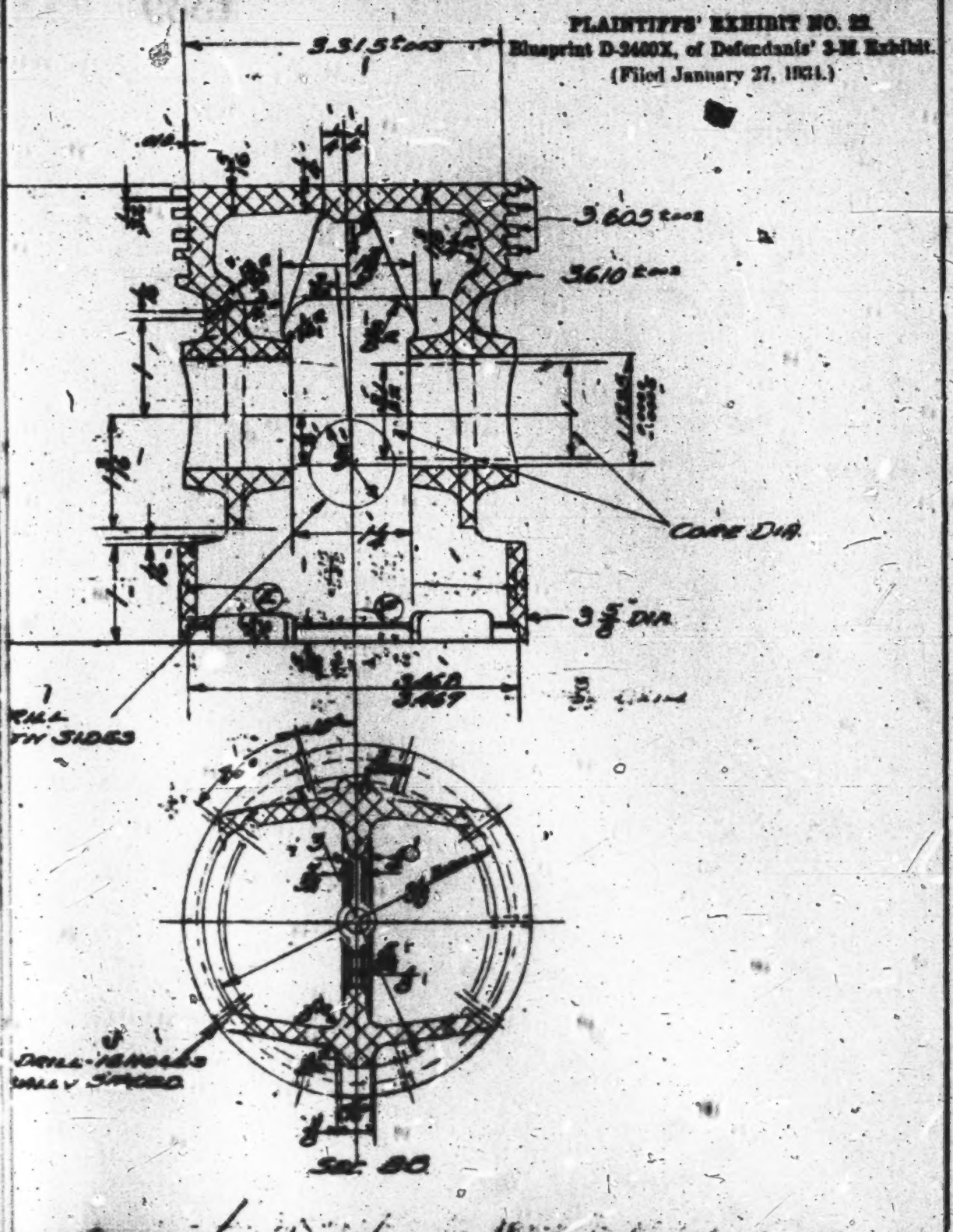
	A	B	C	D	E	F	G

NOTE—
T SCALE
LIMENT
E NUMBER

COMD-23762


Pl Ex 72
ABOUT .075 ON DIA.
NOTE: BEVEL ALL EDGES

PLAINTIFFS' EXHIBIT NO. 22.
Blueprint D-2460X, of Defendants' 3-M. Exhibit.
(Filed January 27, 1934.)



A	B	C	D	E	F	G

ALUMINUM COMPANY OF [illegible]
CLEVELAND, O.
DRAWING

TE— SCALE: 1/2 FULL
DATE 2-1-27

CDN | D-2460X

PLAINTIFFS' EXHIBIT NO. 25.

Interlocutory Decree, Simmons Case.

(Filed January 27, 1934.)

IN THE UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF OHIO

EASTERN DIVISION

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs,

vs.

THE SIMMONS MANUFACTURING CO.,
Defendant.

IN EQUITY
No. 3510.

INTERLOCUTORY DECREE.

This cause coming on to be heard at this term of Court upon the pleadings and the petition of the Defendant, The Simmons Manufacturing Company, to be permitted to and the offer of said Defendant to consent to a decree admitting title to the patents in suit in the Plaintiff, admitting their validity and the infringement thereof by pistons like Exhibit No. B, filed with the answers to Plaintiff's interrogatories, and counsel having been heard upon these questions, it is therefore upon consideration thereof,

Ordered, Adjudged and Decreed as follows:

(1) That Letters Patent of the United States to Spillman & Mooers, No. 1,092,870, dated April 14, 1914, for Piston for Explosion Engines or Motors, is good and valid in law as to all of the claims thereof; that the inventors Edward O. Spillman and Louis P. Mooers named in said patent were the first, true, original and joint inventors of the inventions, improvements and combinations described in said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid:

That Letters Patent of the United States to Franquist, No. 1,153,902, dated September 21, 1915, for Piston, is good and valid in law as to all of the claims thereof; that the inventor, Gustave E. Franquist, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in

said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid;

That Letters Patent of the United States to Schmiedeknecht, No. 1,256,265, dated February 12, 1918, for Piston, is good and valid in law as to all of the claims thereof; that the inventor, Victor E. Schmiedeknecht, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid;

That Letters Patent of the United States to Mooers, No. 1,402,309, dated January 3, 1922, for Piston for Internal Combustion Motors, is good and valid in law as to all of the claims thereof; that the inventor Louis P. Mooers, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid;

That Letters Patent of the United States to Howdeshell, No. Re-16,273, dated February 23, 1926, for Piston for Engine Cylinders, is good and valid in law as to all of the claims thereof; that the inventor, Roland M. Howdeshell, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid;

That Letters Patent of the United States to Maynard, No. 1,655,968, dated January 10, 1928, for Piston, is good and valid in law as to all of the claims thereof; that the inventor Howard E. Maynard, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiffs, The Cleveland Trust Company and Chrysler Corporation, are the lawful owners of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid;

That Letters Patent of the United States to Jardine, No. 1,763,523, dated June 10, 1930, for Piston is good and

valid in law as to all of the claims thereof; that the inventor, Frank Jardine, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid;

That Letters Patent of the United States to Gulick, No. 1,815,733, dated July 21, 1931, for Piston, is good and valid in law as to all of the claims thereof; that the inventor, Edward J. Gulick, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid.

(2) That the Defendant, The Simmons Manufacturing Company, has infringed upon said Letters Patent to Spillman & Mooers, No. 1,092,870, Franquist, No. 1,153,902, Schmidknecht, No. 1,256,265, Mooers, No. 1,40[illegible],309, Howdeshell, No. Re: 16,273, Maynard, No. 1,655,968, Jardine, No. 1,763,523 and Gulick, No. 1,815,733, within the Northern District of Ohio, Eastern Division, and elsewhere in the United States, by the sale of pistons employing or embodying the inventions set forth in each of said patents, as illustrated by Exhibit B; and the Defendant, The Simmons Manufacturing Company, has contributed to the infringement of each of said patents within the Northern District of Ohio, Eastern Division, and elsewhere in the United States.

(3) That Plaintiff do recover from Defendant, The Simmons Manufacturing Company, all profits, gains and advantages which the Defendant has, or shall have, derived, received or made by reason of said infringement, and that Plaintiff do recover from said Defendant any and all damages which the Plaintiff has sustained, or shall sustain by reason of said infringement by said Defendant.

(4) That this cause be, and the same is hereby referred to William B. Woods, Esq., a Master, to ascertain the amount of such gains and profits and the amount of damages sustained by the said Plaintiff by reason of such infringement; that the Defendant file its account with said Master in accordance with the Rules of Equity of

the Supreme Court of the United States relevant thereto; that on such accounting the Plaintiff shall have the right to cause an examination of the officers, servants, agents and employees of said Defendant, orally or otherwise, and also to cause the production of the Defendant's books, vouchers, accounts, bills of lading, shop orders and all documents relating to the pistons sold by Defendant, and that said Defendant, through its representatives, attend for such purpose before the Master from time to time as the said Master shall direct, and that all testimony and exhibits offered and used in this cause on behalf of either party may be referred to and used in such accounting.

That Defendant was duly notified under Section 4900 of the Revised Statutes of the United States of its infringement of said patents prior to the sale of any of the alleged infringing pistons by the Defendant, and that the Defendant continued to infringe notwithstanding said notice.

(5) That an injunction be issued out of and under the seal of this Court, directed to the Defendant, The Simmons Manufacturing Company, its officers, servants, agents, employees, workmen and all their privies, and each and every one of them, enjoining and restraining them during the remainder of the respective terms of said Letters Patent, all but Spillman & Mooers, No. 1,092,870, from directly or indirectly constructing or causing to be constructed and/or using and/or selling or causing to be used or sold or advertising for sale, pistons employing or embodying any of the inventions set forth in any of said patents, or apparatus, article or device to be used, or capable only of use, in a combination infringing any of said patents, and from infringing and contributing to infringement upon or violating any of said Letters Patent in any way whatsoever.

(6) That Plaintiff recover from the Defendant the Plaintiff's full cost in this suit to date and on any matter of accounting herein against this Defendant to be taxed and to have execution therefor.

Entered this 25th day of September, 1931.

JONES,

United States District Judge.

We consent to the entry of the above decree.

E. L. HYDE,

Counsel for Defendant, The Simmons

PLAINTIFFS' EXHIBIT NO. 26.

Conveyance, Declaration of Trust and Agreement between L. P. Mooers and George B. Pitts and The Cleveland Trust Company Dated March 7, 1922.

(Filed January 27, 1934.)

THIS CONVEYANCE, DECLARATION OF TRUST AND AGREEMENT, entered into at Cleveland, Ohio, as of the 7th day of March, 1922, by and between L. P. Mooers and George B. Pitts, of Cleveland, Ohio, First Parties, and The Cleveland Trust Company, a corporation of Ohio, Second Party.

Witnesseth, that

Whereas, the First Parties now own, control or hold the entire right, title and interest in, to and under certain Letters Patent of the United States for inventions or improvements relating and pertaining to and for use in or in connection with pistons for explosion engines or motors, a list of which marked "Inventions" is hereto attached and made part hereof; and

Whereas, said First Parties are desirous of assigning, transferring and conveying the "Property" embracing said "Inventions" hereinafter more fully described, in trust, for the uses and purposes hereinafter set forth, and are desirous of appointing and constituting the Second Party Trustee hereunder, with the respective powers, duties and discretions hereinafter set forth:

Now, Therefore, in consideration of the premises and of the covenants and agreements of the parties hereto, respectively, said parties have agreed and do hereby agree as follows, that

A. For the purposes of this agreement, wherever hereinafter used, the terms:

(1) "Property" shall mean and include (a) Each and all of the Letters Patent; (b) each and all of the applications for Letters Patent; (c) each and all of the inventions and improvements; (d) each and all of the licenses, and (e) all property, rights, money and proceeds of any and every nature whatsoever, which may be acquired, held, controlled, collected or received by said Trustee in connection with this trust and subject to the terms and provisions hereinafter set forth.

(2) "Grantors" shall mean and include the First Parties hereto.

B. For the purposes and objects expressed herein, and in order that the entire control, management and disposition of the "Property" may be vested in trust for the use and benefit of such persons or corporations as may from time to time be the beneficiaries hereunder, the Grantors hereby constitute and appoint the Second Party Trustee hereunder, with all the powers, duties and discretions as hereinafter set forth with reference to the "Property" and the management, control and disposition thereof.

C. Said First Parties, the Grantors, covenant and agree, that

(1) For the joint and several considerations hereinafter set forth, they will and hereby do sell, assign, transfer and set over to said THE CLEVELAND TRUST COMPANY, Trustee, and its successors in trust, the entire right, title and interest owned, held or controlled by them in, to and under each and all of the inventions or improvements embraced by said exhibit "Inventions" hereto attached, and in, to and under each and all of the Letters Patent of the United States and all other countries which have been or may be granted therefor, subject, however, to a license heretofore granted under certain of said Letters Patent to NORDYKE & MARMON COMPANY, of Indianapolis, Indiana, as of the date of April 23, 1920, and which license is hereby assigned and conveyed to this Trustee; in trust, however, for the uses and purposes, and subject to the terms, provisions and conditions hereinafter stated.

(2) At the time of the execution of this instrument, said First Parties own, control or hold the entire right, title and interest in, to and under each and all of said inventions or improvements enumerated and specified in said exhibit "Inventions" and the Letters Patent of the United States which have been granted therefor, subject to said license to NORDYKE & MARMON COMPANY, and that such interests and rights have not been encumbered; that they are free to transfer the same and that they have not entered into or executed and will not enter into or execute any assignment or agreement in conflict herewith.

(3) They and their heirs and legal representatives, without further compensation, will promptly execute and

deliver any further paper, assignments or instruments, and do all other acts which, in the opinion of counsel for said Trustee shall be necessary or convenient to secure to and vest in said Trustee the full and complete legal title to the "Property" aforesaid, or any of it.

D. Subject to the conditions and provisions hereinafter set forth, the Trustee shall be and it hereby is authorized and empowered as follows:

(1) To hold the title to the "Property," to determine upon and in its own name to institute and conduct suits, actions or proceedings at law or in equity relative to this trust, or in any way affecting the "Property," or any part of the same, including suits or proceedings to restrain or enjoin infringement of or to recover incomes or proceeds arising out of the "Property," and damages and profits of any and every nature whatsoever, including those arising from infringements of the Letters Patent, or any of them, embraced by this trust; to settle suits, actions or proceedings, at law or in equity, having to do with said "Property," or any of it, or with this trust, and to compromise or refer to arbitration any claims in favor of or against said trust; and likewise to defend actions or suits affecting said "Property" or this trust.

(2) To manage, develop and promote the "Property" and the interests of this trust, to endeavor to induce the use of said "Inventions or Improvements," and to endeavor to prevent the infringement of said "Letters Patent," or any of them.

(3) To grant, execute and deliver licenses relating and pertaining to said "Property," or any of it, without covenants of warranty, however, on the part of the Trustee, and to change or modify the terms, provisions and conditions thereof from time to time as it may deem to be for the best interest of the trust.

(4) To collect, receive and receipt for all license and royalty fees under said "Property," and all sums of money at any time coming due or belonging to said trust; and to hold, account for and disburse the same.

(5) To acquire and receive the title to and licenses under inventions or improvements, applications for Letters Patent and Letters Patent which, upon their acquisition, shall be included within the term "Property" as used herein.

(6) To execute and deliver such instruments as shall be necessary to convey or assign the "Property," or any

part thereof, without covenants of warranty, however, on the part of the Trustee.

(7) To determine and fix the terms and considerations upon which sales or purchases of property may be made, and to determine and fix the terms and considerations upon which licenses may be granted and executed by the Trustee with respect to the "Property," or any of it, belonging to this trust.

(8) To employ counsel, solicitors, agents and experts, when and for such purposes and periods of time as it may deem to be for the best interests of this trust.

(9) To determine finally what shall be treated as capital, what as income, and what as costs or expenses of the trust, for any and all purposes connected with or affecting this trust.

(10) To make advances or borrow money upon such terms and conditions, from time to time, for the improvement, protection or preservation of the property, or for the acquisition of additional property, whenever such may seem to it desirable or proper. For the repayment of such advances, with interest, the Trustee shall have a lien upon the trust property and for sums so borrowed may issue its promissory notes as Trustee, and secure the repayment thereof by mortgaging or pledging any part or all of the trust property.

(11) To exercise such other powers incidental to carrying out this trust as it shall find necessary and proper, provided, however, that the same shall not be inconsistent with the nature of the trust herein and hereby created.

E. (1) The Trustee hereby accepts said trust and agrees that, subject to and in accordance with the conditions and provisions hereinbefore and hereinafter contained, it will do all things which shall be necessary and proper, in its judgment, to protect and develop the "Property," for the benefit of the beneficiaries of this trust, who shall be trust beneficiaries only, without partnership, associate or any other relationship amongst themselves or between them and the Trustee; and that it will perform the specific duties herein required to be performed by it in accordance with the intentions herein expressed.

(2) It shall be the policy of the Trustee in the conduct of the trust to endeavor to induce or require all who use the patented inventions or improvements belonging

to this trust to recognize the Letters Patent relating thereto.

(3) The Trustee shall employ and keep competent representatives, for the purpose of dealing with all licenses embraced by this agreement, determining the amounts due thereon and collecting and receiving the royalties or income which shall be payable thereunder.

(4) The Trustee shall use its best endeavors regularly to collect all royalties and incomes which shall become due and payable under the licenses granted by it in connection with the "Property"; and shall take proper steps and proceedings and use its best endeavors to collect all sums which shall belong to this trust. And said Trustee shall keep all moneys in its hands as such Trustee, separate and apart from the assets of its Banking Department, but allowing interest thereon at the rate and subject to such rules as may from time to time be in force and effect in its Savings Department.

(5) The Trustee shall keep just and true books of account showing all collections and expenditures of any and every nature whatsoever made by it, and of the "Property" and rights of any and every nature whatsoever, received or acquired by it under the terms of this agreement, said books to be open at all reasonable times for inspection by the beneficiaries hereunder, or their duly authorized representatives; and shall furnish quarterly statements therefrom to the beneficiaries, and each of them hereunder. The fiscal accounting period hereunder shall be from January 1 to December 31, inclusive, of each year during the continuance of this trust.

(6) Quarterly, on the fifteenth day of February, May, August and November of each year during the continuance of this trust, the Trustee shall distribute and pay over to the beneficiaries entitled hereunder pro rata, in accordance with their respective shares as registered on the books of the Trustee, the balance of all revenues, moneys, proceeds of sale or disposition, and license fees or royalties collected by it from said "Property," up to the first day of each said calendar month, respectively, after the deducting therefrom

(1) The reasonable expenses of management and development of the "Property," including all taxes and compensation to the Trustee, and the payment of loans and advances and interest thereon made by or to the Trustee in the interest of this trust;

(2) Such sums of money as may be required in the acquisition of inventions and improvements, applications for Letters Patent, and Letters Patent, as hereinafter provided; and

(3) Such fund or funds as may from time to time hereafter be set aside in reserve, as hereinafter provided.

Furthermore, out of the income of the trust, the Trustee may set aside an allowance for depreciation and/or depletion of the patents, patent rights and other properties embraced by the trust and which shall be subject to depreciation and/or depletion. The Trustee, in determining the amount of such an allowance, shall take into consideration the measure of the depreciation and/or depletion, if any, then allowable as a deduction from the income of the trust, in accordance with the income tax laws of the United States, but the Trustee shall not be bound to adopt such measure as the appropriate measure of the depreciation for which it shall set aside an allowance. The Trustee in its absolute discretion, may either accumulate the fund resulting from the aforesaid allowances for depreciation and/or depletion throughout the life of the trust, or may employ it in connection with the Reserve Fund hereinafter provided for, or may from time to time distribute to the beneficiaries any part or all of the funds so accumulated, thereby reducing to such an extent the "Property." Any such distribution of allowances shall be made to the holders of the certificates of interest in this trust as they shall then appear on the records of the Trustee, and shall be made in proportion to the respective number of shares in said beneficial interest so appearing to be held by them. In any event, upon final distribution of this trust, as provided for in Article F (15) hereof, the entire amount of such accumulations then on hand and of said Reserve Fund, hereinafter provided for, then on hand, shall be distributed in the same manner as is provided for in the final distribution of other assets of the trust.

F. (1) The beneficial interest under this trust shall be represented by seven thousand (7,000) shares, evidenced by Trustee's Certificates of Interest, which said Certificates of Interest shall be in the form of the certificate hereto annexed and marked "Certificate of Interest," and shall be issued as follows:

Forthwith, after the execution of this agreement, the Trustee shall issue and deliver one (1) Certificate of Interest, in the form of the certificate hereto annexed and

marked "Certificate of Interest," which shall be for three thousand (3,000) shares, and be issued and delivered to L. P. Moores.

The remaining four thousand (4,000) shares or any part thereof may be issued, during the continuance of this agreement, by the Trustee, at such prices or for such property or property rights and upon such terms, conditions and provisions, including series denominations therefor, as said Trustee may deem to be for the best interests of the beneficiaries hereunder.

Such certificates and all like certificates issued by the Trustee hereunder, and the beneficial interest represented thereby, shall be transferable, in whole or in part, at all times, but subject to the terms and conditions of this agreement, and subject to such regulations as to transfer as the Trustee may prescribe, with the right in the transferee to receive from the Trustee a Certificate or Certificates of Interest, for the number of shares transferred to it or him; and the registered holder of any Certificate of Interest may be treated by the Trustee as the absolute owner thereof, and of all the rights of the original transferer (to the extent of the number of shares transferred), in the undivided interest in the "Property" represented thereby.

The Trustee shall have power to adopt appropriate rules and regulations in regard to the transfer of Certificates of Interest, and for registering such transfers, and from time to time to change such rules and regulations as occasion may require.

(2) No debt or liability shall be incurred by the Trustee, except such as may be incidental to the management and development of said "Property," and the Trustee shall have no power to bind the beneficiaries hereunder, or any of them, personally; and in every written contract which the Trustee shall authorize, enter into or make, reference shall be made to this Declaration of Trust; and each person or corporation, contracting or dealing with the Trustee, shall look to the funds and "Property" of the trust for payment under such contract or for the payment of any debt, judgment or decree, or of any money that may otherwise become due and payable; and neither the Trustee, nor any beneficiary hereunder, shall be personally liable therefor.

(3) The Trustee may from time to time, as it shall deem expedient, select, retain, employ and discharge such representatives, agents and counsel and such experts as it may consider are best fitted to serve the trust. And the

Trustee may thereupon act, through and on the advice of the person or persons so selected, retained and employed.

(4) The Trustee shall not be required to bring any suit or defend any suit with reference to the "Property" or to do any act or thing, under the terms of this instrument, which, in its judgment, may involve it in any liability unless and until indemnified to its satisfaction against any such liability and said Trustee shall be entitled to indemnity out of the "Property," as well as any funds held by it hereunder, including the Reserve Fund provided for in Article F (7) hereof, for any liability, loss, cost, damage or expense, which it may suffer or sustain in performing any of the terms and conditions of this agreement.

(5) Should the Trustee at any time during the continuance of this trust determine that it is for the best interest of this trust to acquire and receive inventions or improvements, applications for Letters Patent, or Letters Patent, for the purpose of including the same under this trust, it shall proceed to acquire and receive such property upon such terms and considerations as it shall deem appropriate.

(6) Should the Trustee determine that it is for the best interests of the trust to sell or otherwise dispose of the "Property" or any of it at any time, it shall designate, in writing, to the beneficiaries, the terms and considerations for the same, which in its opinion are adequate and for the best interests of the trust, and shall proceed to consummate such sale or disposition in conformity therewith, and the proceeds thereof shall become a part of the "Property" hereunder.

(7) The Trustee, from the moneys in its hands, may set aside a Reserve Fund, sufficient, in its judgment, to defray from time to time the expense of developing, promoting and protecting the "Property" and the cost of any litigation and proceedings connected with or incidental thereto, and to indemnify the Trustee against personal liability or loss, growing out of any action taken by said Trustee hereunder, but such fund shall not at any time exceed the sum of Seven Thousand Dollars ($7,000.00), unless contingencies arise which, in the opinion of the Trustee, justify the reservation of a larger sum in the best interests of the trust, whereupon, at its discretion, the Trustee may increase said Reserve Fund to Twenty-five Thousand Dollars ($25,000.00), for such period of time as it may deem to be expedient. Such Fund shall, so far as practicable, be placed at interest,

as provided for in Article E (4) hereof, and all income derived therefrom shall become a part of the "Property."

(8) The Trustee and any of its successors hereafter appointed may at any time resign the trust hereby created by giving not less than thirty (30) days' notice, in writing, to each of the beneficiaries hereunder by mail, to their addresses, respectively, as appear upon the records of the Trustee. In case of a vacancy caused by the resignation of the Trustee, or in case of the disability of the Trustee for any reason to perform the duties hereunder, a successor or successors to the Trustee shall be chosen as follows: Within ten (10) days from the date of such resignation or notice of such determination of disability, the Trustee shall make application to a Judge of the United States District Court of the Northern District of Ohio for the appointment by him of a successor Trustee or Trustees, and such Judge shall be and is hereby authorized and empowered to name and appoint a successor Trustee or Trustees to act hereunder; provided that should no Federal Judge for such District make the appointment, or there be no Federal Judge in the District, the Trustee shall make application to a Judge of the Common Pleas Court of Cuyahoga County, Ohio, who shall be and hereby is authorized and empowered to make such appointment.

Upon such appointment being made in either manner above prescribed, the successor Trustee or Trustees so appointed shall, upon written acceptance of the trust, become immediately vested with all the rights, power and trusts, and shall assume all the duties of THE CLEVELAND TRUST COMPANY as Trustee hereunder, with the same effect as if originally named as such Trustee; and said THE CLEVELAND TRUST COMPANY, or the party then occupying the position of Trustee, shall, upon demand of such successor Trustee or Trustees, or any one of them, account to such successor, and immediately execute all such assignments conveyances or other instruments as shall be necessary and proper fully to vest the successor Trustee or Trustees with all the right, title and interest in, to and under the "Property," including all sums of money which may then belong to said trust; and upon such accounting and conveyance and the delivery of such "Property," the Trustee, who has so resigned, or who has been removed, shall be from thenceforward relieved and discharged from responsibility hereunder.

(9) The Trustee may advise with counsel as to the interpretation of this instrument and as to any matter relating to the trust herein set forth, and shall be fully protected in any action or omission taken or suffered by it in good faith on the advice of such counsel, and it shall be protected in acting upon any notice, resolution, vote, request, consent, certificate, affidavit, voucher, bond or other paper or document, believed by it to be genuine and to be passed or signed by the proper party. Should the Trustee, in the performance of any of its duties herein and without affecting in any manner the irrevocable nature of this trust, deem it advisable to secure the assent or approval of the Certificate holders hereunder, it may do so by requiring their consent, in writing, to any course or plan of action, or any act or fact done or to be done, and the decision of a majority in interest of the Certificate holders shall be final and binding on all of them, and complete protection and authority to the Trustee. Nothing herein contained, however, shall be deemed to require the Trustee to secure or be bound by the assent or approval of the Certificate holders, or any of them, to any such course or plan of action, or to any act or fact done or to be done.

(10) Should any suit or suits be brought against the Trustee by reason of or because of anything done by it under this agreement and in pursuance thereof, and not resulting from its own bad faith or willful misconduct, or that of its agents, servants or representatives, in connection with or growing out of the terms and provisions hereof, the Trustee is authorized to defend such suits, and for that purpose to employ funds of this trust sufficient therefor, and to fully indemnify it in connection therewith.

(11) The Trustee shall not be liable hereunder for any loss arising out of the execution of this trust so long as it shall act in good faith; and said Trustee shall be liable hereunder only for the bad faith or willful misconduct of itself or its own agents, servants or representatives. In no event shall it be liable for any act or default of any counsel, solicitor, agent or expert, selected, retained or employed pursuant to the provisions of Article D (8), F (3) and F (9) hereof, provided reasonable care shall have been exercised by it in their selection. The Trustee shall not be required to give bond to secure the faithful performance of this trust by it, but in case of the appointment of a successor Trustee or Trustees, not a trust company, the said appointing Judge may, in

his discretion, require such security for the performance of the duties of such successor Trustee or Trustees as in his judgment is just and proper.

(12) The Trustee shall receive reasonable compensation from time to time for all of its services performed under this agreement.

(13) The death of a beneficiary holding a Certificate of Interest hereunder shall not operate to determine or in any manner affect this trust, but his Certificate of Interest shall pass to his executor, administrator, heirs, or legal representatives, and vest in them the ownership of such Certificate or Certificates of Interest, together with the interest in this trust represented thereby, in the same manner as it is held by the beneficiary.

(14) Whenever the Trustee is required under this agreement to communicate with or give notice to the beneficiaries hereunder, it may do so by written communication or notice mailed contemporaneously to each of the beneficiaries entitled to receive the same, addressed to the last known addresses, respectively, of such beneficiaries, as shown by the records of the Trustee.

(15) This trust shall continue until the expiration of all the Letters Patent which may hereafter become a part of the "Property" of said trust, or until all of the "Property" has been sold or disposed of, as hereinbefore provided, and until the Trustee has fully accounted for, distributed and paid over all moneys and "Property" received, or in any manner held by it hereunder.

(16) In the interpretation and construction of this instrument, the laws of the State of Ohio shall govern.

IN WITNESS WHEREOF, said L. P. MOORES and GEORGE B. PITTS have executed and delivered this instrument, and, as evidencing its acceptance of the trusts and confidences herein imposed upon it, said THE CLEVELAND TRUST COMPANY has caused this instrument to be executed and its corporate seal to be affixed hereto by executive officers, thereunto duly authorized, the execution and delivery being at Cleveland, Ohio.

L. P. MOORES,
GEORGE B. PITTS.

THE CLEVELAND TRUST COMPANY,
R. A. MALM,
Vice President.
A. J. PERPLER,
Assistant Trust Officer.

"INVENTIONS"

Patentee	*Number*	*Date*
Spillman & Mooers	1092,870	April 14, 1914
H. C. Marmon	1293,846	Feb. 11, 1919
L. P. Mooers	1347,819	July 27, 1920
L. P. Mooers	1402,308	Jan. 3, 1922
L. P. Mooers	1402,309	Jan. 3, 1922

and the undivided one-half of any right, title and interest now owned or held by said Louis P. Mooers in Letters Patent of countries foreign to the United States corresponding to said Letters Patent of the United States No. 1092,870.

This list forms a part of the Conveyance, Declaration of Trust and Agreement entered into as of the 7th day of March, 1922, between Louis P. Mooers and George B. Pitts and The Cleveland Trust Company.

CERTIFICATE OF INTEREST

No. .... Shares

THIS IS TO CERTIFY, that ....., Address ....., is owner of ..... shares of undivided interest in the net profits and avails, when the same may be distributable, from certain "Property" comprising certain Inventions or Improvements, Applications for Letters Patent which have been or may be filed therefor and Letters Patent which may be granted thereon, and rights thereunder, more particularly described in a certain Conveyance, Declaration of Trust and Agreement entered into as of the 7th day of March, 1922, by and between L. P. MOOERS and GEORGE B. PITTS, therein referred to as "Grantors," and THE CLEVELAND TRUST COMPANY, therein referred to as "Trustee," a copy of which is on file at the principal office of said THE CLEVELAND TRUST COMPANY, in the City of Cleveland, Ohio, and open to the inspection of any holder of this Certificate, and that the legal title to said property is held by said THE CLEVELAND TRUST COMPANY for the use and benefit of the various registered owners of interests therein, subject to and in accordance with the provisions of the aforementioned Conveyance, Declaration of Trust and Agreement so on file, reference to which is hereby made for a description of the nature and extent of the "Property," the rights and privileges of the holders of said Certificates of Interest, and the terms and conditions upon which said Certificates are issued. The holder of

this certificate, by acceptance hereof expressly ratifies all of the terms and conditions of said Conveyance, Declaration of Trust and Agreement. THE CLEVELAND TRUST COMPANY assumes no responsibility as to the validity of the title to the "Property" purported to be conveyed to it in trust, pursuant to the aforementioned Conveyance, Declaration of Trust and Agreement. The registered holder of this Certificate may be treated as the actual owner of this Certificate and the interest represented thereby for all purposes whatsoever.

This Certificate and the interest evidenced thereby may be transferred upon surrender thereof to the Trustee, duly endorsed, and subject to such rules and regulations governing transfers as the Trustee may establish.

THE CLEVELAND TRUST COMPANY,

By .....

Vice-President.

.....

Assistant Trust Officer.

Cleveland, Ohio, ..., 19.....

PLAINTIFFS' EXHIBIT NO. 28.

Bill of Sale, Amplex to Gulick.

(Filed January 27, 1934.)

AMPLEX MANUFACTURING CO.

MOTORS AND MOTOR CARS

Mishawaka, Ind., July 16, 1914.

Invoice No. 184. SOLD TO E. J. Gulick,
Your Order No. Verbal. Mishawaka,
Terms Cash. Indiana.
Subject to sight draft at maturity

Our Order No.	Shipped	Via	
1 Model E K Toy Tonneau Car #747, Engine # Buda 6 SSU4-7137, Axle #725 Color Black and Gray 36 x 5 Q.D. Cl. Continental Rims, 36 x 5 Knight tires, Combination Rear Gasoline Tank and Tire Carrier, Electric Head Lights and Tail Lamp, Warner Comb. 60 mi Speedometer and Clock, Pantasote Top, Universal Wind Shield and Seat Covers. Car equipped with Westinghouse Electric Starting and Lighting System and Mea Dual Ignition System.		600 00	600 00

Received Payment.
Amplex Mfg. Co.
Per R. W. RANDALL

Miles on Speedometer 816
New type pistons in motor

All claims against this invoice must be made upon receipt of goods

(Pencil Notation on Back)

R. Jeruegan,

This mileage 6112 when car was left in garage and was not driven but little after until Cook received it.

E. J. GULICK.

Pltf Ex 29

3

FILED
JAN 27 1934
At O'clock M.
F. J. DENZLER, Clerk
U. S. District Court, N. D. O.

Fig 1

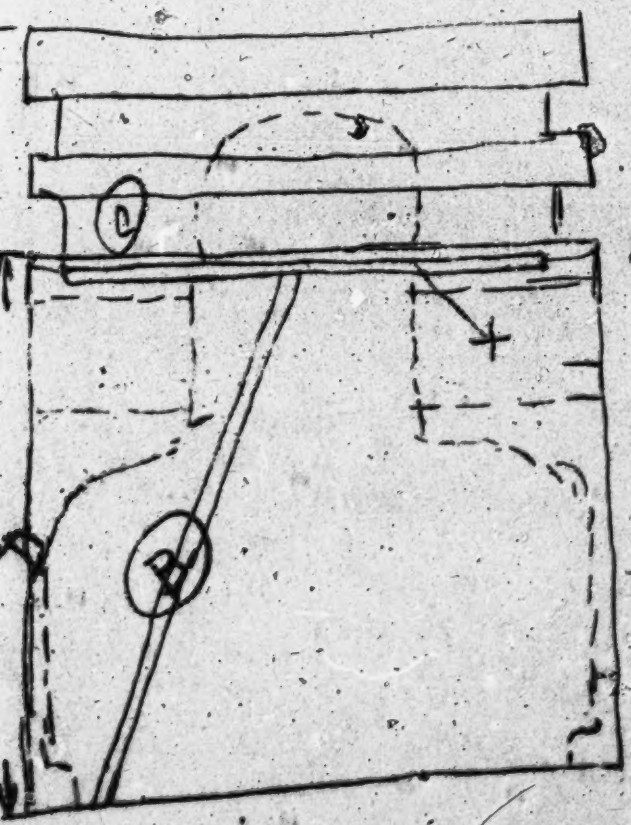
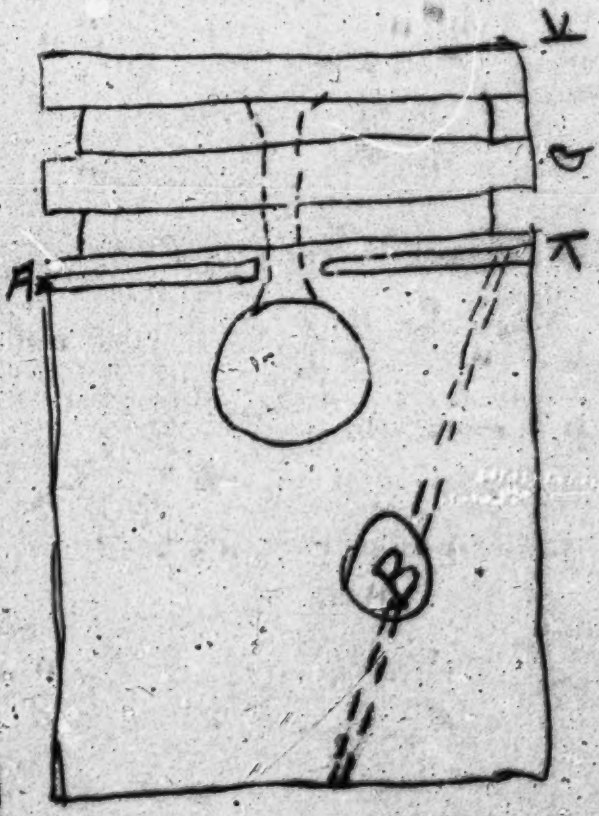
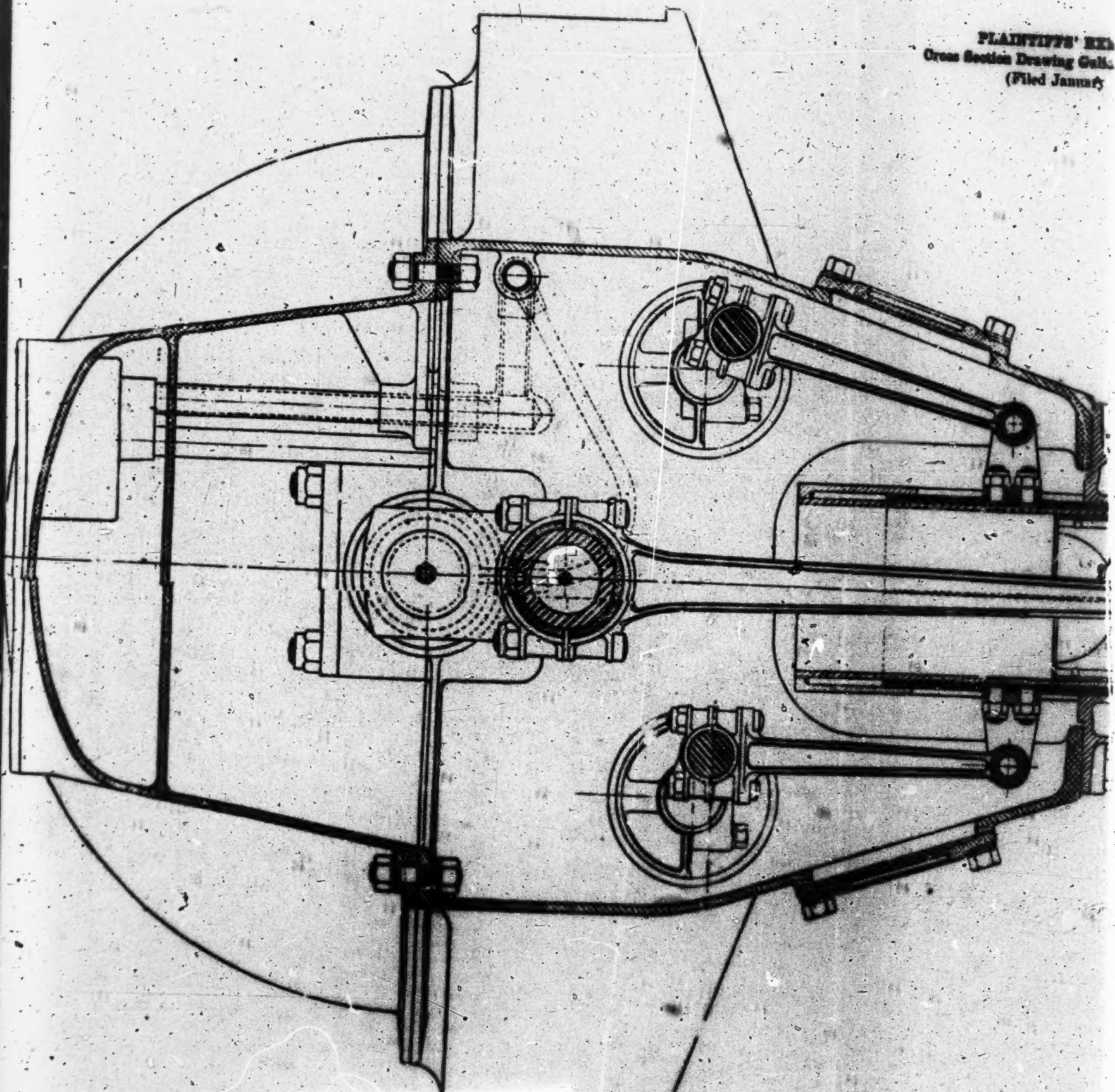


Fig 2

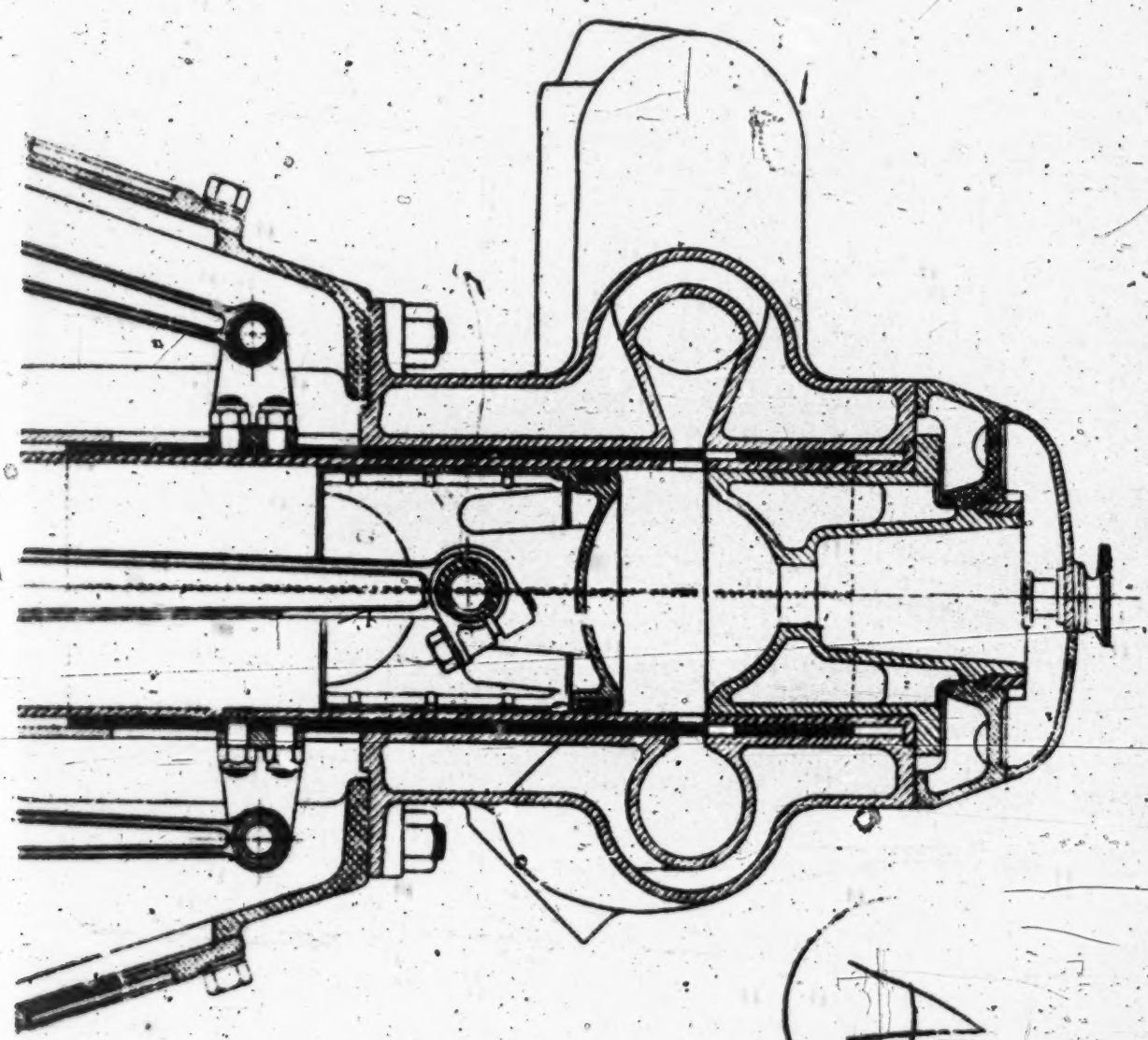


PLAINTIFFS' EXHIBIT NO. 29.
Sketch by Randall of Grilloh Plates.
(Filed January 27, 1934.)

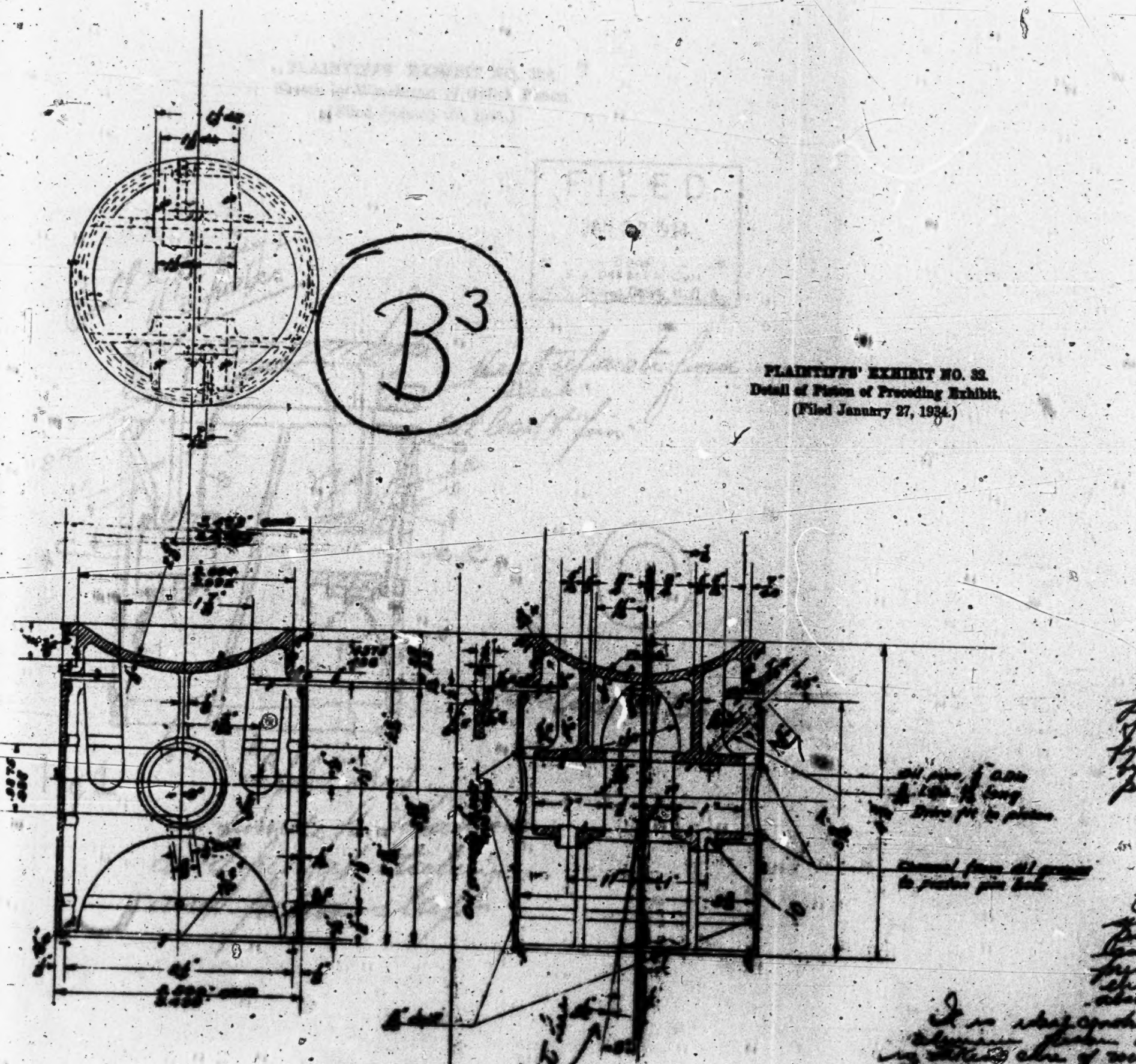
PLAINTIFF'S EX
Cross Section Drawing Gall
(Filed January



PLAINTIFFS' EXHIBIT NO. 31.
Cross Section Drawing Gulick Sleeve Valve Motor.
(Filed January 27, 1934.)



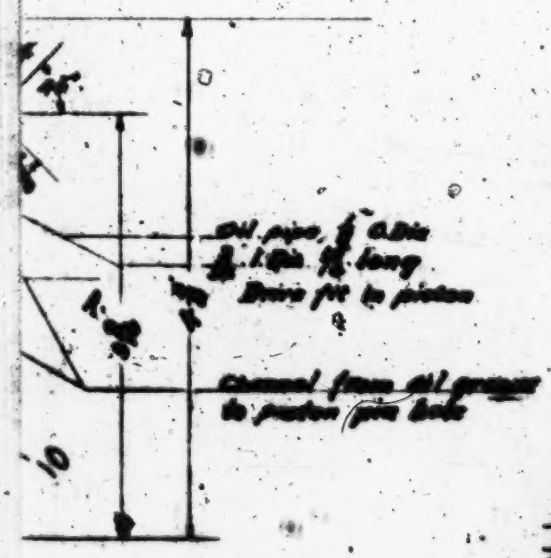
A 7



PLAINTIFFS' EXHIBIT NO. 32.
Detail of Piston of Preceding Exhibit.
(Filed January 27, 1934.)

Shelrich Exhibit #9
Patent Balloon
Type piston

AINTIFFS' EXHIBIT NO. 32.
of Piston of Preceding Exhibit.
(Filed January 27, 1934.)



Cross Head Type

Design of Piston which automatically provides for Expansion Compensation

E.J.C. MOTOR
MISHAWAKA, IND
PISTON
6 Rod
FULL SIZE 6-24-14
KER.

PLAINTIFFS' EXHIBIT NO. 35A.
Sketch by Winchester of Gullick Piston.
(Filed January 27, 1934.)

FILED
JAN 27 1934
F. J. DEVALERA, Clerk
U. S. District Court, N.D.O.

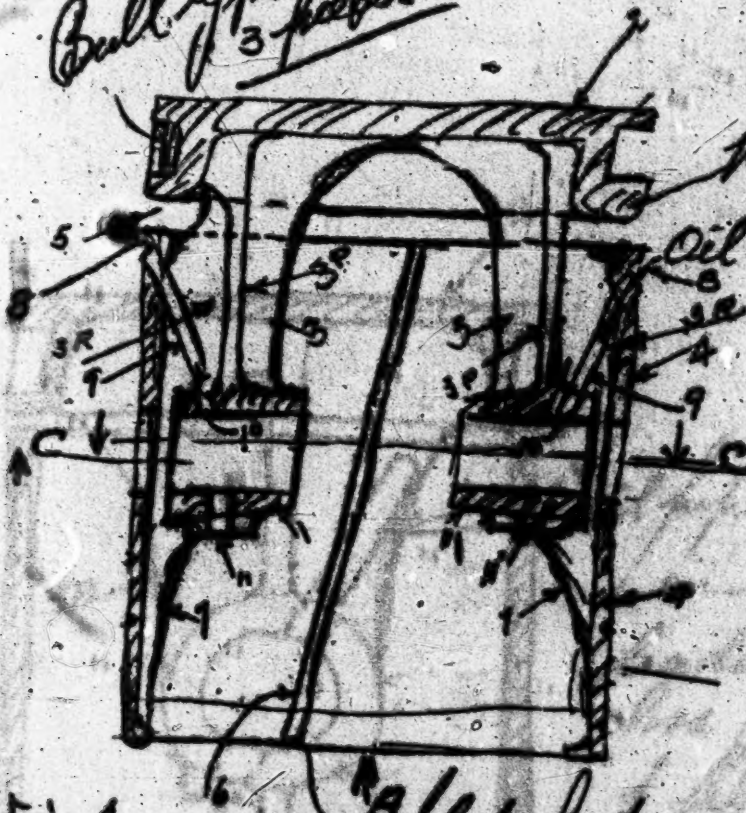


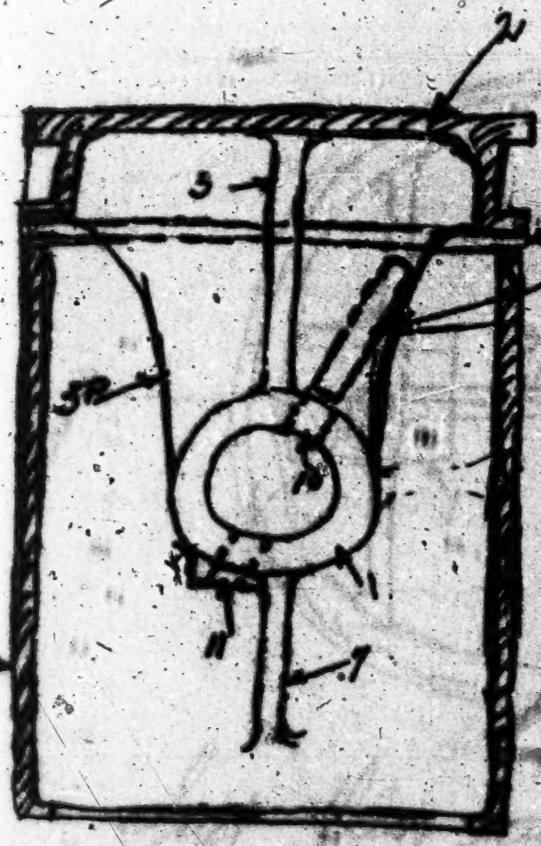
Fig 1

split skirt
A fluid for upper ring
and grooved sealing
and piston slap.

39

PLAINTIFFS' EXHIBIT NO. 35B.
Sketch by Winchester of Gulick Piston.
(Filed January, 27, 1934.)

FILED
JAN 27 1934
at ... o'clock ... M.
F J DENZLER Clerk
U S District Court N. D. O.



oil fuse & lubricate from
1 or each side of piston
bearing & through fuse
line for lubrication
of piston pins.

Fig. 2. Section A-A.

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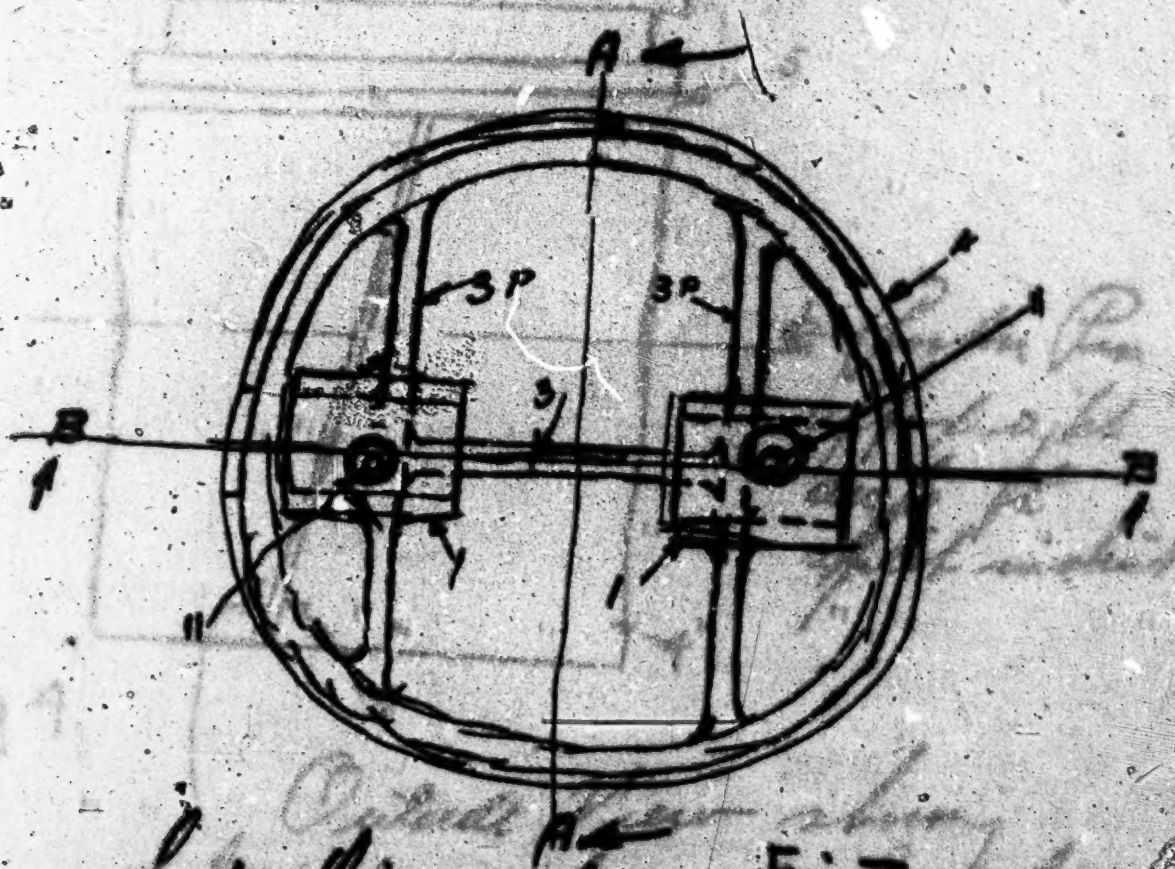
JAN 27 1934
E. J. DEWEESE, Clerk
U.S. District Court, N. D.

30

PLAINTIFFS' EXHIBIT NO. 38C.
Sketch by Winchester of Gullek Piston.
(Filed January 27, 1934.)



Lud Peer et al. Fig 3

30

PLAINTIFFS' EXHIBIT NO 36D.
Sketch by Winchester of Gulick Piston.
(Filed January 27, 1934.)

FILED
JAN 27 1934
At ..... O'clock ..... M.
R. J. DEEZLER Clerk
U. S. District Court, N. D. O.

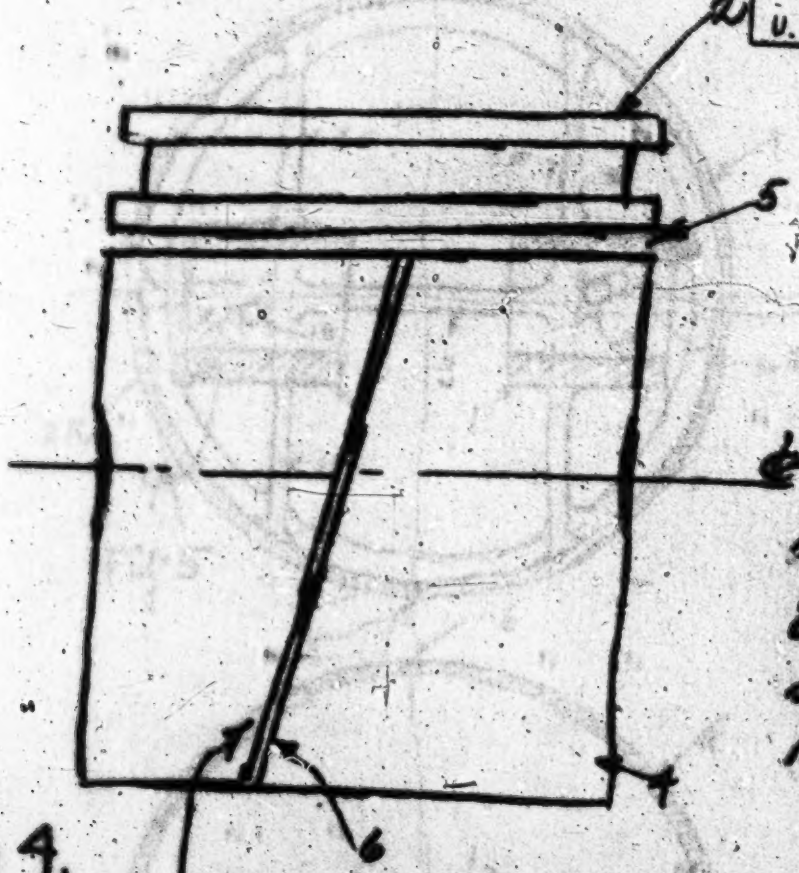


Fig 4.

Piston Pin
Approx right
angle to
split in skirt

Outside View showing
split to compensate for Expansion

PLAINTIFFS' EXHIBIT NO. 38.
Sketch by Winchester of Gullek Piston.
(Filed January 27, 1934.)

FILED
JAN 27 1934
M. ____ O'clock ____ M
E. J. DENZLER, Clerk
U. S. District Court N. D. O.

3°

Section C.C. Intake toward head

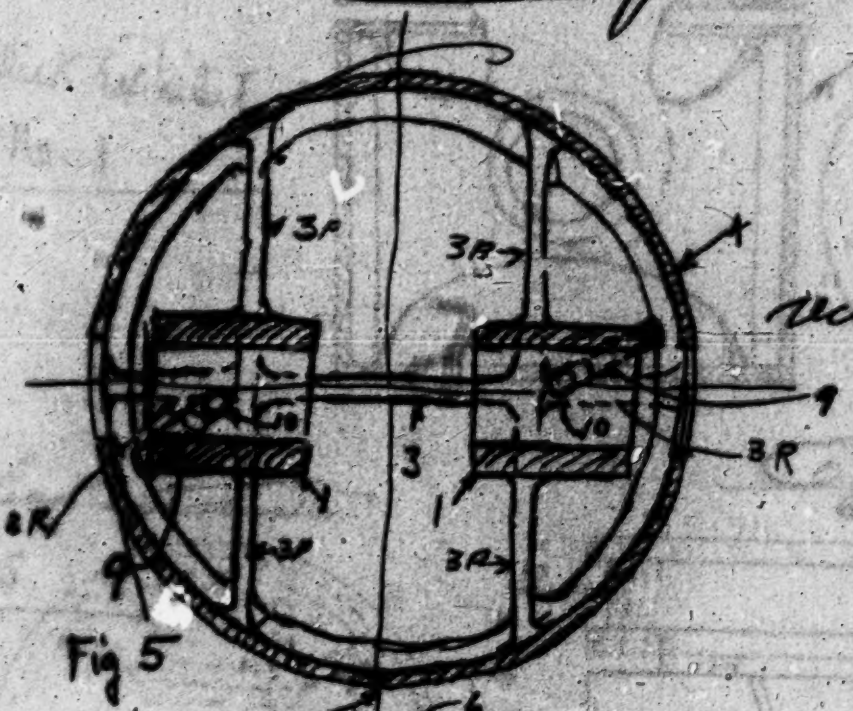
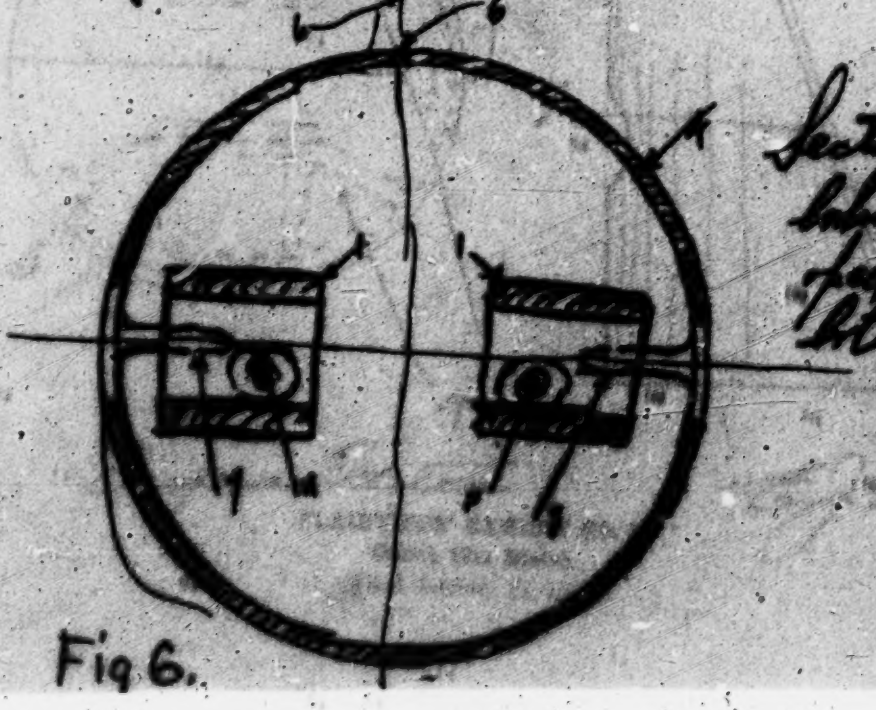


Fig 5

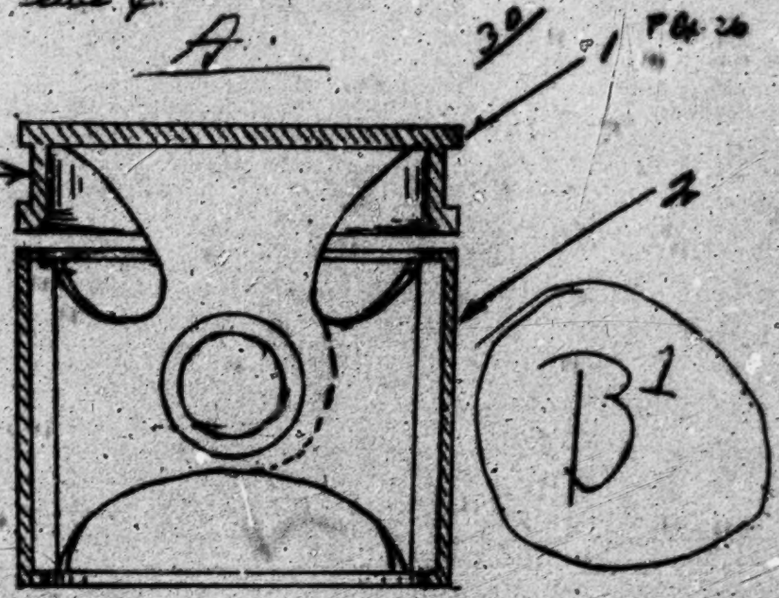


Section CC
Intake toward
Top end
Piston of Piston

Fig 6.

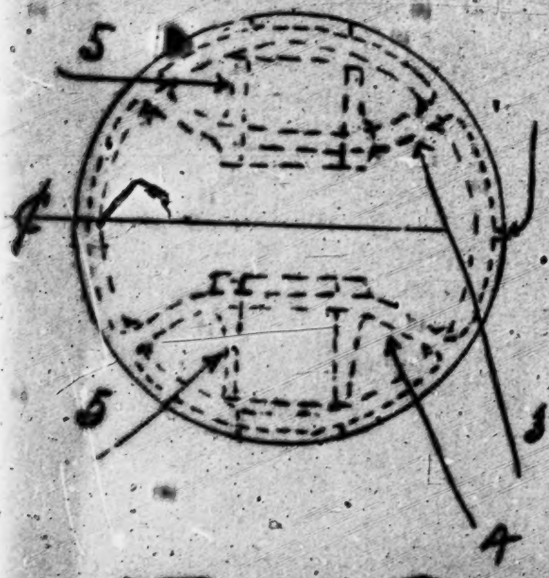
Half section thru line A
& line B

A

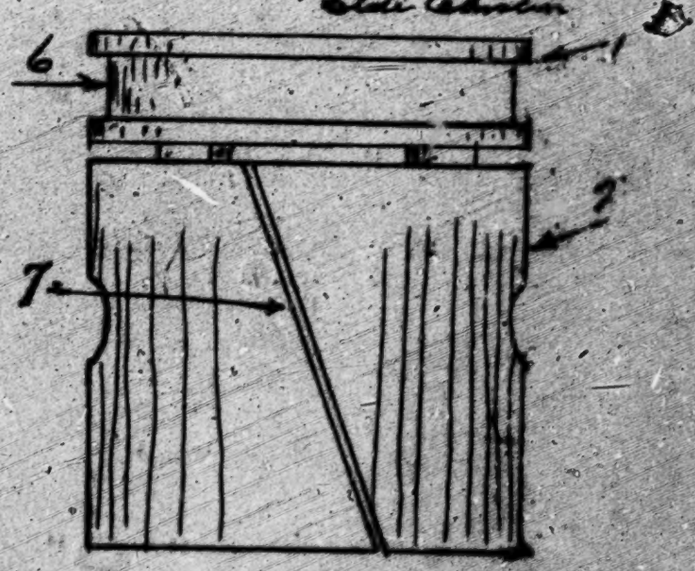


Gallick Exhibit
No. 1

B
Head end elevation



C
Side elevation



Eugene Peters

E J Ewing.

PLAINTIFF'S EXHIBIT NO. 24.
Gallick Mill Patent.
(Filed January 27, 1934.)

PLAINTIFFS' EXHIBIT NO. 37.

Gulick Written Description.

(Filed January 27, 1934.)

Relating to an Engine Piston which provides for and prevents seizing binding or scoring when hot or oversize. It is a well known fact that all engine Pistons are necessarily made smaller than the cylinders in which they operate to provide for lubricant and prevent seizing or cutting due to the expansion of the piston in the cylinder when hot.

1. The Piston consists of a Head 1—having a groove 6—for carrying packing Rings and a Body 2 which provides Bearing surface and which is split as indicated by 7 to provide for expansion.

2. The Head 1 and Body 2 are held together by the ribs 3 and 4. Ribs 3 and 4 carry Bosses 5 for receiving the piston pin. Ribs 3 and 4 are not limited to shape or position and the no of ribs and location and shape may be altered as desired.

The head 1 is machined small enough to allow for expansion and not bind or seize, while the Body 2 is machined as close to size as is possible to make a fit and any expansion is taken up by the slot 7—and which prevents any seizing or Binding between the piston and cylinder walls in which the piston moves. By this construction it is possible to make a fit that prevents any pounding which is prevalent with the common type of Piston.

PLAINTIFFS' EXHIBIT NO. 38a.

Supplemental Contract between The Cleveland Trust Company and Aluminum Company of America dated April 26, 1924.

[Also offered as Defendants' Exhibit 4-T.]

(Filed January 27, 1934.)

This AGREEMENT made and entered into this 26th day of April, 1924, by and between THE CLEVELAND TRUST COMPANY, of Cleveland, Ohio, hereinafter sometimes called the licensor, and ALUMINUM COMPANY OF AMERICA, a Pennsylvania corporation of Pittsburgh, Pa., hereinafter sometimes called the licensee.

WITNESSETH:

WHEREAS, the parties hereto have of even date entered into a contract hereinafter sometimes called the license agreement, a copy of which is attached hereto and marked Exhibit "D," and to which this contract is a supplement.

NOW, THEREFORE, in consideration of the premises and of the covenants and agreements of the parties hereto made herein and in the license agreement, a copy of which is attached hereto and marked Exhibit "D," said parties have covenanted and agreed, and do hereby covenant and agree with each other further as follows:

1. In case the royalty per piston payable by any sub-licensee to the licensee, under the license agreement, is established at less than one cent ($.01) per piston by Board of Arbitration or others acting beyond the control of the licensee, the licensor shall accept the royalty so set at less than one cent ($.01) per piston as a royalty in full to be paid by the licensee hereunder for all pistons made and/or sold by such sub-licensee.

2. The licensee shall make vigilant effort to collect all royalties accruing from the sub-licensees under their sub-licenses, respectively. If the licensee is unable, after the exercise of due diligence, to collect royalties due from any sub-licensee, the licensee will be relieved from paying to the licensor the licensor's proportion of such uncollectable royalties, and if the licensee has advanced to the licensor any royalties which prove to be uncollectable, the licensor will refund to or credit the licensee with the amount of such uncollectable portion so advanced. After the licensee has notified the licensor that any royalties are uncollectable, the licensee will, upon

demand in writing from the licensor, assign the licensor's proportion of such uncollectable account to the licensor.

3. In case the license agreement is cancelled for any reason whatsoever other than because of failure of the licensee to carry out its obligations or any of them to the licensor thereunder, the licensor agrees to reassign to the licensee all patents, patent applications or other patent rights which have been assigned by the licensee to the licensor under said license agreement (Exhibit "D" attached hereto), subject, however, to any and all licenses and sub-licenses which have been granted either by the licensor or the licensee or which the licensor is under contract to grant with respect to such patents, patent applications or other patent rights to (1) Walker M. Levett Company and W. M. Levett Corporation of New York; (2) The National Piston Company, Incorporated, of New York and (3) The Kant-Skore Piston Company, of Cincinnati, Ohio, copies of which contracts are hereto attached and marked Exhibits E, F and G, respectively.

In Witness Whereof the parties hereto have caused this instrument to be executed in duplicate by their respective officers hereunto duly authorized as of this 26th day of April, A. D. 1924.

The Cleveland Trust Company,
By A. R. Horn,
Vice President.

Attest:
A. J. Perfler,
Ass't. Tr. Officer.

Aluminum Company of America,
By W. P. King,
Vice President.

Attest:
G. R. Gibbons,
Secretary.

STATE OF OHIO,
COUNTY OF CUYAHOGA, SS.:

On this 26 day of April, 1924, personally appeared before me A. R. HORA and A. J. PERFLER, to me known to be, respectively, the Vice-President and Assistant Trust Officer of The Cleveland Trust Company, Cleveland, Ohio, and acknowledged to me that they executed the foregoing instrument on behalf of the said Company and for the uses and purposes therein set forth.

ROBERT M. BOYD,
Notary Public.

(Notarial Seal)

STATE OF OHIO,
CUYAHOGA COUNTY, SS:

On this 26 day of April, 1924, personally appeared before me W. P. KING to me known to be, the Vice President of Aluminum Company of America and acknowledged to me that he executed the foregoing instrument on behalf of the said Company and for the uses and the purposes therein set forth.

JOHN H. WATSON, JR.,
Notary Public.

(Notarial Seal)

STATE OF PENNSYLVANIA,
COUNTY OF ALLEGHENY, SS:

On this 26th day of April, 1924, personally appeared before me G. R. GIBBONS to me known to be, the Secretary of Aluminum Company of America, and acknowledged to me that he executed the foregoing instrument on behalf of the said company and for the uses and purposes therein set forth.

M. D. WEDNER,
Notary Public.

(Notarial Seal)

My commission expires March 21st, 1925.

PLAINTIFFS' EXHIBIT NO. 38b.

License Agreement between The Cleveland Trust Company and Aluminum Company of America.

[Also offered as Defendants' Exhibit 4-S.]

(Filed January 27, 1934.)

LICENSE AGREEMENT

This license agreement made and entered into by and between THE CLEVELAND TRUST COMPANY, of Cleveland, Ohio, hereinafter called sometimes the licensor, and ALUMINUM COMPANY OF AMERICA, a Pennsylvania corporation, hereinafter sometimes called the licensee, witnesseth:—

WHEREAS, the Licensor owns the entire right, title and interest in and to the following Letters Patent and applications for Letters Patent in the United States—

Number	*Patentee*	*Date*
1,092,870	Spillman & Mooers	April 14, 1914
1,279,184	J. G. Vincent	Sept. 17, 1918
1,293,846	H. C. Marmon	Feb. 11, 1919
1,327,147	Harold D. Church	Jan. 6, 1920
1,347,819	L. P. Mooers	July 27, 1920
1,402,308	L. P. Mooers	Jan. 3, 1922
1,402,309	L. P. Mooers	Jan. 3, 1922
Ser. No. 204,661	E. J. Gulick, Filed	Nov. 30, 1917, and

has arranged to acquire the entire right, title and interest in and to Letters Patent 1,153,902 dated September 21, 1915, to Gustave E. Franquist and,

WHEREAS, the licensor may acquire other United States patents, patent applications and patent rights relating to pistons, and/or the processes and/or the machines for making the same, during the life of this agreement; and

WHEREAS, the said licensee is desirous of acquiring a license to make, use and sell the inventions included in the said patents and applications acquired and to be acquired by the licensor for the full term for which said patents are or shall be granted.

NOW, THEREFORE, in consideration of the premises and of the covenants and agreements of the parties hereto, respectively as hereinafter set forth, said parties have covenanted and agreed, and do hereby covenant and agree with each other as follows:

I.

The Licensor grants the licensee the exclusive right to make, use and sell and the exclusive right to grant to others the right to make, use and sell, the inventions and devices embodying the inventions covered by the patents and applications above named or to be covered by any continuations and divisions, renewals or reissues of the same, for the full term of each of said patents, with the exception that the licensor reserves to itself the right to make, use and sell and the right to grant to others the right to make, use and sell pistons made entirely of cast iron or steel, and it is specifically agreed that the licensor neither grants nor agrees to grant to the licensee in this agreement the exclusive right to make use or sell pistons made entirely of cast iron or steel, it being understood that the licensee has hereunder a non-exclusive license to make, use and sell, and the right to grant to others the right to make, use and sell cast iron or steel pistons embodying the inventions covered by the patents and applications above named, or to be covered by any continuations and divisions, renewals or reissues of the same, for the full term of each of said patents. This license and agreement will be automatically extended to cover any other and further patents or applications or other rights under patents which the licensor may acquire relating to pistons and/or processes and/or machines for making the same, unless excluded therefrom by the licensee as hereinafter provided, and the licensor agrees to execute any further instruments and perform any further acts, if any are required, to consummate the granting of licenses to the licensee or parties indicated by the licensee under this agreement. This license is subject to a license granted by The Cleveland Trust Company to Nordyke & Marmon Company, April 23, 1920, a copy of which is attached hereto marked Exhibit A.

II.

The Licenser releases and discharges the Licensee, all of its controlled and subsidiary companies, and Aluminum Manufacturers, Inc., and The Aluminum Castings Company, all sub-licensees under this agreement and all vendees and/or users of pistons, the castings for which were heretofore acquired from the Licensee or either of the said companies, or said sub-licensees, from any and all claims whatsoever for damages or profits by reason

of any alleged past infringement of any of the patents aforesaid now owned by the Licensor and arising out of the manufacture, use and sale of such pistons; and from any claim or claims for past damages or profits which shall be acquired by the Licensor in the future, during the continuance of this agreement, and theretofore arising out of the manufacture, use and sale of such pistons; and agrees not to institute or to aid or abet the institution of any suit against the Licensee or any of its controlled and subsidiary companies, or Aluminum Manufactures, Inc. or The Aluminum Castings Company, or sub-licensees, or the vendees or users of pistons, the castings for which were heretofore acquired from the Licensee or either of the said companies, or said sub-licensees, for any alleged past infringement of any patents relating to the subjects covered by the patents or applications named herein or for damages and profits because of alleged past infringement thereof and heretofore arising out of the manufacture, use and sale of such pistons.

III.

1. (a) The Licensor shall institute and prosecute to a conclusion with due diligence suit or suits against any or all infringers of the patents included within the terms of this agreement necessary reasonably to protect the interests of the licensee acquired hereunder, provided that the licensor be indemnified to its satisfaction by the licensee for any costs or expenses which the licensor may suffer or sustain in connection with or growing out of any such suit.

(b) The licensor shall defend any suit or suits, so far as such defence shall be necessary reasonably to protect the interests of the licensee acquired hereunder, brought because of the alleged infringement of any letters patent covering the design of pistons made, sold or used under this agreement and for which royalties are paid under this agreement, provided that the licensor be indemnified to its satisfaction by the licensee for any costs or expenses which the licensor may suffer or sustain in connection with or growing out of any such defense.

2. Should the licensor bring and prosecute or defend as above provided such infringement suit or suits at its own expense, all profits or damages recovered in said suit or suits shall be the absolute property of the licensor.

3. In the event of the failure of the licensor promptly to institute and vigorously prosecute or to defend such suit or suits as may be necessary reasonably to protect the interests of the licensee hereunder, then and in that event, the licensee having reasonably indemnified the licensor, may in the name of the licensor or the names of the licensor and licensee jointly institute or adopt and diligently prosecute or defend at the licensee's expense such suit or suits as may be required reasonably to protect its interests. The licensor at any time shall have the right to join in the prosecution or defense of such suit or suits with its own counsel and at its own expense.

4. Should the licensee bring or prosecute or defend as above provided any such infringement suit or suits or should the licensee furnish indemnification to the licensor in connection with suits brought or prosecuted or defended by the licensor and pay any sum on account of such indemnification, it shall have the right to apply all royalties payable by it on the reasonable costs and expenses of such suit or suits, including attorney's fees, or on said sum paid on account of indemnification and shall apply the sum, if any, recovered in any such suit, first, to the reimbursement of it for said reasonable expenses and costs, including attorney's fees, and not theretofore reimbursed to it out of royalties or sums paid on account of indemnification, and second, to the payment to the licensor of all sums theretofore deducted by the licensee from royalties and applied to the said reasonable costs and expenses, including attorney's fees, of such suit or payments of indemnification and the balance shall be the absolute property of the licensee.

IV.

The Licensee agrees that it will within the months of January, April, July and October of each year from and after the execution hereof, furnish to the licensor, its successors or assigns in interest, a written statement under oath which shall show:—

(a) the number of pistons made by or for it, imported by it and sold or otherwise disposed of by it during the preceding three calendar months which contain or which to the licensee's knowledge are to be modified or fabricated by the licensee's vendees to contain and embody any invention covered by any of the claims of any of the letters patent and application recited herein, or in the future

acquired by the licensor and included herein. This report shall be made whether the licensee makes or sells any pistons during the preceding royalty period, or not, and

(b) the number of such pistons sold by the licensee and for which the vendee has been subsequently credited.

The first report shall include the pistons contemplated in this paragraph between January 1, 1924 and April 1, 1924.

V.

The Licensee will pay the licensor royalty of one cent ($.01) upon each piston sold* or otherwise disposed of by it during the life of this agreement embodying in its construction any invention covered by one or more of the claims of the letters patent and application named herein or in the future acquired by the licensor and added hereto, and upon each piston made and sold by the licensee with the intention or the knowledge of the licensee that it shall be modified or fabricated by the licensee's vendee in such a way as to embody in its construction any invention covered by one or more of the claims in the letters patent or applications covered hereby.

It is understood that no royalties will be payable or collectible upon the licensed pistons which have been sold and for which the vendee thereof has been subsequently credited, and that if any royalties have been paid upon the licensed pistons which are sold, and for which the vendee has been subsequently credited, the licensee shall have credit therefor upon the next due payment.

VI.

Within thirty (30) days after it shall have furnished, in January, April, July and October of each year, statements specified in the paragraph herein numbered (IV), the licensee shall and will pay to the licensor, its successors or the assigns of its interest in said letters patent, the royalties upon the pistons covered by said reports, at the rate prescribed.

---

*Sold in this contract means and includes only licensed pistons which are both contracted for and delivered, during the life of this agreement.

VII.

The licensee agrees that it will keep accurate books of account, giving full particulars of the licensee's business in the inventions covered by this agreement and will in the event of controversy admit the licensor or its duly accredited agent at all reasonable times to inspect the same.

VIII.

In the event that the combination set forth in any of the claims of the application for letters patent and of the letters patent to be granted thereon above recited and the letters patent above recited or acquired in the future and added hereto is held by a court of final jurisdiction or by an inferior court from whose decree no appeal is taken or the appeal is denied or dismissed, to be an infringement of any other patent in any patent suit brought in the United States against the licensor, the licensee, any other of the licensor's Licensees, any sub-licensees or any of its or their vendees, the licensee shall have, and is hereby given, the right and option to exclude from this license any such claim or claims or the letters patent or application for letters patent containing such claim or claims, as the case may be, and to have the royalty payable hereunder reduced proportionately if any, to the reduction, caused by such judicial holdings in the value of the patents and applications comprehended by this agreement, such proportion to be determined by arbitration as hereinafter in paragraph (XX) hereof provided, or to terminate this agreement altogether by giving to the licensor notice in writing of its election so to do within six (6) months from the rendition of the judicial holding of the court of final jurisdiction or after the expiration of the time for appeal or after the appeal has been denied or dismissed.

IX.

The licensor authorizes and empowers the licensee to grant sub-licenses to manufacture, make, use and/or sell within the United States pistons which contain and embody any inventions covered by any of the claims of any of the letters patent and applications for letters patent comprehended herein; provided that each and every such sub-license so granted shall expressly refer to this license, shall be of no greater scope than this license and shall terminate therewith; and provided further that all

royalties payable by the sub-licensee shall be payable directly to the Aluminum Company of America or its order and the proportion thereof due to the licensor, namely, one cent ($.01) per piston, shall be payable forthwith to the licensor by the licensee hereunder.

X.

This agreement and license shall be transferable to the successors or assigns of either of the parties hereto, but in that event the successors or assigns shall be bound by the provisions of this agreement and obligated to conform thereto.

XI.

The licensee will not during the life of this agreement contest, or aid others in contesting the validity of any of the letters patent included within this agreement or afterwards acquired by the licensor and included in this agreement.

XII.

The licensee can have and hereby is given the right and option to exclude from this license any letters patent or application for letters patent or other patent rights which the licensor may acquire after the execution of this license provided the licensee gives the licensor notice in writing of such exclusion within ninety (90) days after notice in writing to the licensee by the licensor of the acquisition of any letters patent or applications or other patent rights, not recited in this agreement.

XIII.

The licensee shall pay royalties only upon pistons both contracted for and delivered during the term of this license,—pistons contracted for before or delivered after the term of the contract are free of royalties.

XIV.

If either of the parties hereto neglects or refuses to keep any of its covenants herein, then the other party hereto may serve on the derelict party by registered mail a notice in writing of such default and if the derelict party shall continue such default for thirty (30) days after the serving of such notice, then the aggrieved party may at its option cancel this license by a notice in writing of such cancellation and termination, provided, how-

ever, that the foregoing remedy shall not exclude any other remedy which the aggrieved party may have at law or in equity. The waiver of any breach by either party shall not be interpreted as constituting a waiver of any further breach or breaches.

XV.

The licensor hereby grants to the licensee the exclusive right to make, use and sell the inventions covered by any foreign patents or applications for foreign patents, which the licensor now owns or controls which relate to pistons with the exception that the licensor reserves to itself the right under such foreign patents to make, use and sell and the right to grant to others the right to make, use and sell pistons made entirely of cast iron or steel. The licensor agrees to release the licensee, its subsidiary and controlled companies, the Aluminum Manufactures, Inc., The Aluminum Castings Company, their vendees, and all users of their pistons, from any claim or claims for alleged infringement of foreign patents, which the licensor now has or in the future may acquire against any of them. It is specifically agreed that the licensor neither grants nor agrees to grant to the licensee in this agreement the exclusive right to make, use or sell pistons made entirely of cast iron or steel under such foreign patents. It being understood that the licensee has a non-exclusive license under, and the right to license others under such foreign patents to make, use and sell pistons embodying inventions covered by any foreign patents which the licensee now owns or controls when such pistons are made entirely of cast iron or steel. The Licensor agrees, upon demand of the licensee, to execute all instruments and perform all acts necessary to complete the licenses under this paragraph. This license and agreement will be automatically extended to cover any other and further foreign patents or applications for foreign patents or other rights under foreign patents which the licensor may acquire relating to pistons and/or processes and/or machines for making the same, unless excluded therefrom by the licensee as hereinafter provided, and the licensor agrees to execute any further instruments and perform any further acts, if any are required, to consummate the granting of licenses to the licensee or parties indicated by the licensee under this agreement.

XVI.

Should the inventions, for the use of which the Licensee pays royalty under this agreement, be made, sold or used generally by others, in the aluminum piston or automobile trade, not licensed under the patents included in this contract, forthwith upon the finding by arbitration as hereinafter provided that such a condition exists, the Licensee may, at its option, (a) terminate this contract on ninety (90) days notice in writing to the Licensor of its intention so to do, or (b) surrender its exclusive license granted by this contract and retain a non-exclusive right and license to continue the use of the patented inventions without the payment of any royalty therefor until such infringement ceases.

XVII.

The licensee shall have the following privileges and rights:

(a) At any time within two (2) years after the date of execution of this agreement, upon ninety (90) days' notice in writing to the Licensor of its intention so to do, to cancel this agreement; and

(b) To surrender this license at the end of two (2), four (4), six (6), eight (8), ten (10) years or any other period consisting of an even number of years after the date of execution hereof by giving to the licensor notice in writing of its desire and intention so to do at least ninety (90) days prior to the date the license is to be terminated; but any such termination of this license as in this article specified shall not release the licensee or the licensor, from any obligations theretofore accruing to the opposite party.

XVIII.

The licensee shall use reasonable diligence in manufacturing and/or marketing pistons embodying inventions licensed hereunder, and, in the event that, during the continuance of this agreement, it should not do so, the licensor shall have the following rights, options and privileges exercisable by it forthwith upon the finding by arbitration as hereinafter provided that the licensee has not used and is not using such diligence;

(a) To cancel or terminate this agreement by giving six (6) months' notice in writing to the said licensee of its desire and intentions so to do; whereupon at the expiration of said six (6) months from the date of said notice this agreement shall be terminated.

(b) To grant an additional license or licensee under the inventions or improvements, applications for letters patent and letters patents, or any of them, then embraced by and included within the terms of this license.

XIX.

Should the licensee, taking advantage of its privilege under any of the provisions of this contract, elect to terminate this contract and stand out from under the same, the licensee shall not be estopped to deny the validity of any of the patents covered or comprehended by this contract and shall not be deprived of any of the defenses or the rights of a defendant in an ordinary patent infringement suit, but, on the contrary, shall stand in the position of one who had never entered into this contract.

XX.

In the event either party hereto calls for an arbitration as provided for in this contract, each party shall select an arbitrator and the two arbitrators shall select a third arbitrator. In the event that the two arbitrators fail to select a third or in the event either party fails to select its arbitrator, it is agreed that the third and/or second arbitrator may be selected by the district judge of the United States District Court, Northern District of Ohio, Eastern Division, who has then been longest in said office. The three arbitrators thus selected shall constitute the Board of Arbitration and the parties hereto shall submit their contentions to this Board of Arbitrators at a time and in a manner determined by the arbitrators. The decision of any two arbitrators shall be final and binding on the parties hereto. Each party shall bear the expense of its arbitrator and both shall bear the expense of the third arbitrator share and share alike.

XXI.

The licensor agrees that should it at any time during the life of this agreement grant licenses under the patents, now included or in the future included in this agreement, or under the substantial and material patents now included or to be included in this agreement, at lower rates than one cent ($.01) per piston as provided for herein, or otherwise upon more favorable terms than are provided for herein, then this agreement shall, on the request of the licensee, be modified to make its terms as favorable as these upon which any subsequent license may be granted.

XXII.

The licensee agrees to assign, or cause to be assigned, to the licensor all United States patents and applications for United States patents which it now owns or in the future during the life of this contract acquires or controls relating to pistons per se.*

XXIII.

This agreement, in the construction of which the laws of the State of Ohio shall govern, is made by the Licensor under title conveyed by or acquired under and subject to the terms, provisions and conditions of a certain Conveyance, Declaration of Trust and Agreement entered into as of the 7th day of March, 1922, by and between Louis P. Mooers and George B. Pitts and The Cleveland Trust Company, Trustee, the Licensor herein, a copy of which is on file at the principal office of said The Cleveland Trust Company in the City of Cleveland, and open to the inspection of the Licensee, and unless terminated as hereinbefore provided, shall terminate with the date of expiration of the last Letters Patent now or hereafter embraced in said Declaration of Trust and Agreement.

In Witness Whereof, the parties have caused this instrument to be executed in duplicate by their respec-

* Pistons per se means pistons whose patentability depends upon physical, structural characteristics of the piston and not upon the character of the material in the piston or the molds, machines or the processes by which the piston is made.

tive officers hereunto duly authorized as of this 26th day of April, A. D. 1924.

THE CLEVELAND TRUST COMPANY,
By R. A. MALM,
Vice President.
(Corporate Seal)

Attest:
A. J. PERFLER,
Ass't. Tr. Officer.

ALUMINUM COMPANY OF AMERICA,
By W. P. KING,
Vice President.

Attest:
G. R. GIBBONS,
Secretary.
(Corporate Seal)

Approved for Execution by The C. T. Co.
R. T. S., *Counsel.*

STATE OF OHIO,
COUNTY OF CUYAHOGA, ss:

On this 11th day of April, 1924, personally appeared before me R. A. Malm and A. J. Perfler, to me known to be, respectively, the Vice-President and Assistant Trust Officer of The Cleveland Trust Company, Cleveland, Ohio, and acknowledged to me that they executed the foregoing instrument on behalf of the said Company and for the uses and purposes therein set forth.

ROY F. HAGGETT,
Notary Public.
(Notarial Seal)

STATE OF OHIO,
CUYAHOGA COUNTY, ss:

On this 26th day of April, 1924, personally appeared before me W. P. King to me known to be, the Vice President of Aluminum Company of America and acknowledged to me that he executed the foregoing instrument on behalf of the said Company and for the uses and the purposes therein set forth.

JOHN H. WATSON, JR.,
Notary Public.

STATE OF PENNSYLVANIA,
COUNTY OF ALLEGHENY, ss:

On this 26th day of April, 1924, personally appeared before me G. R. Gibbons, to be known to be, the Secretary of Aluminum Company of America, and acknowledged to me that he executed the foregoing instrument on behalf of the said company and for the uses and purposes therein set forth.

M. D. WEDNER,
Notary Public.

My commission expires March 21st, 1925.

EXHIBIT A.

LICENSE AGREEMENT

THIS AGREEMENT made this 23rd day of April, 1920, between THE CLEVELAND TRUST COMPANY, a corporation of the State of Ohio, hereinafter called the Licensor, and NORDYKE & MARMON COMPANY, a corporation of the State of Indiana, hereinafter called the Licensee.

WITNESSETH, that

WHEREAS, the Licensor owns and holds title to the following: (a) Letters Patent of the United States No. 1,092,870, patented April 14, 1914, to E. O. Spillman and L. P. Mooers, for Piston for Explosion Engines or Motors; (b) application for Letters Patent of the United States, Sr. No. 106,502 and 106,503, filed June 28, 1916, by Louis P. Mooers for Pistons for Internal Combustion Motors; and (c) also owns and has title to all claims for damages and profits arising out of past infringement by the Licensee of said Letters Patent, and

WHEREAS, the Licensee is desirous of acquiring a license under said Letters Patent and those which may be granted upon the aforesaid applications for Letters Patent:

NOW, THEREFORE, for and in consideration of the premises, of the covenants and agreements of the parties hereto, respectively, as hereinafter set forth, and in further consideration of the assignment of Letters Patent of the United States No. 1,293,846, dated February 11, 1919, to Licensor, by Howard C. Marmon, the parties hereto have covenanted and agreed, and do hereby covenant and agree with each other, as follows:

A. The Licensor, on its part, does hereby:

(1) Grant to the Licensee the right and license, not exclusive, to manufacture, have manufactured for it, assemble, and use in and sell for use in Licensee's engines, mechanism and apparatus having and containing any or all of the inventions shown, described and claimed in the above recited Letters Patent and applications for Letters Patent and the Letters Patent of the United States which may be granted upon the latter, or either of them.

(2) Release and discharge the Licensee and all who have sold or used the product of the Licensee from any and all claims whatsoever for damages and profits arising by reason of infringement of said Letters Patent by Licensee's product.

B. It is understood and mutually agreed that:

(1) This license is not divisible and is not assignable by the Licensee excepting to a successor in business of the Licensee.

(2) This agreement is made by the Licensor subject to the terms, provisions and conditions of a certain Declaration of Trust and Agreement entered into, in writing, as of the date of August 4, 1917, by and between Louis P. Mooers and George B. Pitts, as Grantors, and The Cleveland Trust Company, *et al.*, as Trustee, including Article F-2 thereof, which reads:

"2. No debt or liability shall be incurred by the Trustee, either collectively or individually, except such as may be incidental to the management and development of said 'Property' and the Trustee shall have no power to bind the beneficiaries hereunder, or any of them personally; and in every written contract which the Trustee, or either of them, shall authorize, enter into or make, reference shall be made to this Declaration of Trust; and each person or corporation contracting with the Trustees, or either of them, shall look to the funds and 'Property' of the Trust for payment under such con-

tract or for the payment of any debt, judgment or decree, or of any money that may otherwise become due and payable; and neither of the Trustees, nor any beneficiary hereunder, shall be personally liable therefor."

A copy of which Agreement is on file at the principal office of said The Cleveland Trust Company in the City of Cleveland, Ohio, and open to inspection of the Licensee.

IN TESTIMONY WHEREOF, said parties have hereunto set their hands and seals by their respective officers hereunto duly authorized by said The Cleveland Trust Company and said Nordyke & Marmon Company, respectively, the execution being at the places and on the dates appearing under their respective names below.

THE CLEVELAND TRUST COMPANY,
By E. L. MASON,
Vice President.

Attest:
E. B. MERRELL,
A-Secretary.

Cleveland, Ohio,
Dated: May 6th, 1920.

NORDYKE & MARMON COMPANY,
By W. C. MARMON,
President.

Attest:
H. G. SHAFER,
Secretary.

Indianapolis, Indiana. Dated April 23rd, 1920.

STATE OF OHIO, COUNTY OF CUYAHOGA, ss:

On this 6th day of May, 1920, personally appeared before me E. L. Mason and E. B. Merrell to me known to be, respectively, the Vice-President and Asst. Secretary of The Cleveland Trust Company, of Cleveland, Ohio, and acknowledged to me that they executed the foregoing instrument on behalf of the said Company and for the uses and purposes therein set forth.

ROY F. HAGERTY,
Notary Public.

STATE OF INDIANA, COUNTY OF MARION, SS:

On this 23 day of April, 1920, personally appeared before me W. C. Marmon and H. G. Shafer, to me known to be, respectively, the ..... President and ..... Secretary of Nordyke & Marmon Company, of Indianapolis, Indiana, and acknowledged to me that they executed the foregoing instrument on behalf of the said company and for the uses and purposes therein set forth.

CHARLES W. REESE.

My commission expires Feb. 5, 1923.

PLAINTIFFS' EXHIBIT NO. 38c.

License Agreement between Walker M. Levett Co., W. M. Levett Corp., Walker M. Levett and The Cleveland Trust Company, dated April 11, 1924.

(Filed January 27, 1934.)

AGREEMENT

THIS AGREEMENT made and entered into this 11 day of April, 1924, by and between WALKER M. LEVETT COMPANY and W. M. LEVETT CORPORATION, both being corporations of the State of New York and WALKER M. LEVETT, of New York City, jointly and severally, (hereinafter referred to as parties of the first part) and THE CLEVELAND TRUST COMPANY, of Cleveland, Ohio, a corporation of the State of Ohio, (hereinafter referred to as the Trust Company).

WITNESSETH:

WHEREAS, the Parties of the First Part own the entire right, title and interest in and to applications for Letters Patent of the United States, Serial No. 470,502, filed May 18, 1921 of Gustav R. Kelm; and

WHEREAS, parties of the first part desire, under certain conditions, to dispose of their interest in and to the said application for patent and in any other patents or applications for Letters Patent relating to pistons per se* which they may own wholly or in part, or subsequently acquire, and

WHEREAS, the Trust Company desires to obtain the entire right, title and interest in and to the said application for letters patent and the entire right, title and interest possessed by the parties of the first part, and each of them, in and to any other patents or applications relating to pistons per se now owned or subsequently acquired by the parties of the first part together with certain rights to past infringements of the said patent or patents and application or applications.

Now, THEREFORE, in consideration of the covenants and agreements of the parties hereto, respectively as hereinafter set forth, said parties have covenanted and

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* Pistons per se means pistons whose patentability depends upon physical, structural characteristics of the piston and not upon the character of the material in the piston or the molds, machines or the processes by which the piston is made.

agreed, and do hereby covenant and agree with each other as follows:

1. The Parties of the First Part agreed to sell, assign, transfer and set over to and hereby do sell, assign, transfer and set over to The Cleveland Trust Company as trustee under a certain conveyance, Declaration of Trust and Agreement dated March 7, 1922, copy of which is attached, marked "Exhibit A" * and another copy of which is on file with The Trust Company, the entire right, title and interest in and to said application for Letters Patent Serial No. 470,502 and the entire right, title and interest possessed by the Parties of the First Part, and each of them, in and to any Letters Patent or applications for Patent relating to pistons per se now owned, held, wholly or in part, on the date of the execution of this agreement or subsequently acquired; together with the right to sue and collect for all past infringements of the said patent or patents, or of any patent or patents issuing from such application or applications, and to collect damages and profits arising out of such infringement and apply the same to the benefit of The Cleveland Trust Company, as trustee.

2. The Parties of the First Part hereby agree for themselves, their respective executors and legal representatives, to execute and deliver to The Cleveland Trust Company, as trustee, any and all other papers or documents necessary or desirable more fully to convey to The Cleveland Trust Company, as trustee, the entire right, title and interest in and to the said applications, and Letters Patent when, and as, the same may be requested by The Cleveland Trust Company as trustee, and to do any and all further acts which may be desirable or necessary more effectually to secure to or vest in The Cleveland Trust Company, as trustee, its successors and assigns the entire right, title and interest in and to the said invention, Letters Patent and applications hereby sold, assigned and transferred or intended so to be.

3. The Parties of the First Part hereby agree for themselves, their respective executors and legal representatives, to assign to The Cleveland Trust Company, as Trustee, without further consideration the entire right,

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*PRINTER'S NOTE:

The "Exhibit A" referred to above was not attached to Exhibit 38c.

title and interest in and to any United States Letters Patent or application relating to pistons per se which they may in the future acquire forthwith upon obtaining the same together with whatever rights they may acquire to sue and collect for past infringement thereof and to apply any damages and profits so recovered to the benefit of The Cleveland Trust Company as trustee.

4. In case the sub-license from the Aluminum Company of America to the parties of the first part, a copy of which is attached hereto, made a part hereof and marked "Exhibit B," * is canceled or terminated for any reason whatsoever, excepting the failure of parties of the first part reasonably to comply with their obligations thereunder, and said parties of the first part forthwith applied to whomsoever then holds or controls as owner or exclusive licensee, the inventions, applications for Letters Patent and Letters Patent embraced by such sub-license, for another sub-license upon terms at least as favorable for parties of the first part as those in said sub-license "B" contained, and such owner or exclusive licenses as the case might be, fails to execute or deliver to parties of the first part such a sub-license within thirty (30) days from the date of such application by said parties of the first part, then and in that event, this agreement shall be deemed and construed henceforth to operate as such a sub-license having the terms and conditions of the sub-license, Exhibit "B," applicable for such purpose and said parties of the first part shall account thereunder directly to The Trust Company.

5. This agreement, in the construction of which the laws of the State of Ohio shall govern, is made by The Trust Company under title conveyed by or acquired under and subject to the terms, provisions and conditions of said Conveyance, Declaration of Trust and Agreement of which "Exhibit A" is a copy.

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*PRINTER'S NOTE:

The "Exhibit B" referred to above was not attached to Exhibit 38e.

IN WITNESS WHEREOF the parties hereto have set their hands and affixed their seals this 11th day of April, 1924.

WALKER M. LEVETT COMPANY,
W. M. LEVETT,
President.
(Corporate Seal)

ATTEST:
L. E. VALCOURT,
Secretary.

W. M. LEVETT CORPORATION,
W. M. LEVETT,
President.
(Corporate Seal)

ATTEST:
L. E. VALCOURT,
Secretary.

WALKER M. LEVETT.

A. F. HUSSEY.

THE CLEVELAND TRUST COMPANY,
By R. A. MALM,
Vice President.
(Corporate Seal)

ATTEST:
A. J. PERVLER,
Ass't. Trust Officer.

Apr 11 1924
Approved for Execution by The C. T. Co.
R. T. S., *Counsel.*

STATE OF NEW YORK,
COUNTY OF NEW YORK, ss.

On this 20 day of March, 1924, at New York City, before me personally appeared WALKER M. LEVETT, to me known, who, being by me duly sworn, made oath that he signed the foregoing instrument and he acknowledged the same to be his free act and deed.

ALLEN C. BAKEWELL,
Notary Public.

NOTARY PUBLIC.
N. Y. Co. Clerk's No. 30.
N. Y. Co. Register's No. 4129.
Commission expires March 30, 1924.

STATE OF NEW YORK,
COUNTY OF NEW YORK, ss.

On this 20th day of March, 1924, at New York City before me personally appeared W. M. LEVETT and L. E. VALCOURT, to me known, who, being by me duly sworn, made oath that they are the president and secretary, respectively, of W. M. LEVETT CORPORATION, the corporation described in and which executed the foregoing instrument, and are its agents for this purpose duly authorized, that they signed the same in behalf of said corporation, that the seal affixed to said instrument is the seal of said corporation and was so affixed by authority of the Board of Directors; and they acknowledged the foregoing instrument to be their free act and deed and the free act and deed of said corporation.

ALLEN C. BAKEWELL,
Notary Public.

NOTARY PUBLIC.
N. Y. Co. Clerk's No. 30.
N. Y. Co. Register's No. 4129.
Commission expires March 30, 1924.

STATE OF NEW YORK,
COUNTY OF NEW YORK, ss.

On this 20th day of March, 1924, at New York City before me personally appeared W. M. LEVETT and L. E. VALCOURT, to me known, who, being by me duly sworn, made oath that they are the president and secretary, respectively, of WALKER M. LEVETT COMPANY, the company described in and which executed the foregoing instrument, and are its agents for this purpose duly authorized, that they signed the same in behalf of said corporation, that the seal affixed to said instrument is the seal of said corporation and was so affixed by authority of the Board of Directors; and they acknowledged the foregoing instrument to be their free act and deed and the free act and deed of said corporation.

ALLEN C. BAKEWELL,
Notary Public.

NOTARY PUBLIC.
N. Y. Co. Clerk's No. 30.
N. Y. Co. Register's No. 4129.
Commission expires March 30, 1924.

STATE OF OHIO,
COUNTY OF CUYAHOGA, ss.

On this 11th day of April, 1924, at Cleveland, Ohio, personally appeared before me R. A. MALM and A. J. PRITZEN, to me known to be respectively a vice-president and assistant trust officer of The Cleveland Trust Company, of Cleveland, Ohio, and acknowledged to me that they executed the foregoing instrument on behalf of said Company as Trustee, and for the uses and purposes therein set forth.

ROY F. HAGGETT,
Notary Public.

PLAINTIFFS' EXHIBIT NO. 30d.

License Agreement between The National Piston Company, Gustave E. Franquist, James E. Diamond and The Cleveland Trust Company, dated April 11, 1924.

(Filed January 27, 1934.)

AGREEMENT.

THIS AGREEMENT made and entered into this 11th day of April, 1924, by and between THE NATIONAL PISTON COMPANY, INCORPORATED, a corporation of the State of New York, GUSTAVE E. FRANQUIST, of Rochester, N. Y. and JAMES E. DIAMOND, of Mount Vernon, N. Y. jointly and severally, (hereinafter referred to as Parties of the First Part) and THE CLEVELAND TRUST COMPANY of Cleveland, Ohio, a corporation of the State of Ohio, (Hereinafter referred to as the Trust Company).

WITNESSETH:

WHEREAS, the Parties of the First Part own the entire right, title and interest in and to United States Letters Patent, No. 1,153,902, issued September 21, 1915, to Gustave E. Franquist and,

WHEREAS, Parties of the First Part desire, under certain conditions, to dispose of their interest in and to the said patent and in any other patents or applications for Letters Patent relating to pistons per se* which they may own wholly or in part, or subsequently acquire, and

WHEREAS, The Trust Company desires to obtain the entire right, title and interest in and to the said patent to Franquist and the entire, right, title and interest possessed by the Parties of the First Part, and each of them, in and to any other patents or applications relating to pistons per se now owned or subsequently acquired by the parties of the First Part together with certain rights to past infringements of the said patent or patents and application or applications.

Now, THEREFORE, in consideration of the covenants and agreements of the parties hereto, respectively, as hereinafter set forth, said parties have covenanted and agreed, and do hereby covenant and agree with each other as follows:—

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* Pistons per se means pistons whose patentability depends upon physical, structural characteristics of the piston and not upon the character of the material in the piston or the molds, machines or the processes by which the piston is made.

1. The Parties of the First Part agree to sell, assign, transfer and set over to and hereby do sell, assign, transfer and set over to The Cleveland Trust Company as trustee under certain Conveyance, Declaration of Trust and Agreement dated March 7, 1922, a copy of which is attached, marked "Exhibit A"* and another copy of which is on file with the Trust Company, the entire right, title and interest in and to United States Letters Patent No. 1,153,902, issued September 21, 1915, and the entire right, title and interest possessed by the Parties of the First Part, and each of them, in and to any Letters Patent or applications for Patent relating to pistons per se now owned, held, wholly or in part, on the date of execution of this agreement or subsequently acquired; together with the right to sue and collect for all past infringements of the said patent or patents, or of any patent or patents issuing from such application or applications, and to collect damages and profits arising out of such infringement and apply the same to the benefit of The Cleveland Trust Company as trustee; except that this assignment does not convey or intend to convey to The Trust Company the right to sue for and collect for past infringement of said Franquist patent by Walker M. Levett or The W. M. Levett Corporation, or the Walker M. Levett Company, of New York City.

2. The Trust Company hereby agrees forthwith upon the execution of this agreement to issue in the name of and transfer to the said Parties of the First Part, or their nominee or nominees, three hundred (300) shares in the beneficial interest created by said Conveyance, Declaration of Trust and Agreement, of which "Exhibit A" is a copy.

3. The Parties of the First Part hereby agree for themselves, their respective executors and legal representatives, to execute and deliver to The Cleveland Trust Company, as trustee, any and all other papers or documents necessary or desirable more fully to convey to The Cleveland Trust Company, as trustee, the entire right, title and interest in and to the said Letters Patent and applications, when, and as, the same may be requested by The Cleveland Trust Company, as trustee, and to do any and all further acts which may be desir-

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*PRINTER'S NOTE:

The "Exhibit A," referred to above was not attached to Exhibit 38d.

able or necessary more effectually to secure to or vest in The Cleveland Trust Company, as trustee, its successors and assigns the entire right, title and interest in and to the said invention, Letters Patent and applications hereby sold, assigned and transferred or intended so to be.

4. The Parties of the First Part hereby agree for themselves, their respective executors and legal representatives, to assign to The Cleveland Trust Company, as trustee, without further consideration the entire right, title and interest in and to any United States Letters Patent or application relating to pistons per se which they may in the future acquire forthwith upon obtaining the same together with whatever rights they may acquire to sue and collect for past infringement thereof and to apply any damages and profits so recovered to the benefits of The Cleveland Trust Company, as Trustee.

5. In case the sub-license from the Aluminum Company of America to The National Piston Company, Incorporated, a copy of which is attached hereto, made a part hereof and marked "Exhibit B," * is cancelled or terminated for any reason whatsoever, excepting the failure of The National Piston Company, Incorporated, reasonably to comply with its obligations thereunder, and said The National Piston Company, Incorporated, forthwith applies to whomsoever then holds or controls as owner or exclusive licensee, the inventions, applications for Letters Patent and Letters Patent embraced by such sub-license, for another sub-license upon terms at least as favorable for The National Piston Company, Incorporated, as those in said sub-license "B" contained, and such owner or exclusive licensee as the case might be, fails to execute or deliver to The National Piston Company, Incorporated, such a sub-license within thirty (30) days from the date of such application by said The National Piston Company, incorporated, then and in that event, this agreement shall be deemed and construed henceforth to operate as such a sub-license having the terms and conditions of the sub-license, Exhibit "B," applicable for such purpose and The National Piston Company, Incorporated, shall account thereunder directly to The Trust Company.

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*PRINTER'S NOTE:

The "Exhibit B" referred to above was not attached to Exhibit 38d.

6. This agreement, in the construction of which the laws of the State of Ohio shall govern, is made by the Trust Company under title conveyed by or acquired under and subject to the terms, provisions and conditions of said certain Conveyance, Declaration of Trust and Agreement, of which "Exhibit A" is a copy.

In Witness Whereof the parties hereto have set their hands and affixed their seals this 11th day of April 1924.

The National Piston Company,
Incorporated,
Henry Monkley,
President,
J. E. Diamond,
Gustave E. Franquist.

Attest:
J. E. Diamond,
Secretary.
Vice Pres.

The Cleveland Trust Company,
R. A. Malm,
Vice-President.

(Corporate Seal)

Attest:
A. J. Perfler,
Ass't Trust Officer.

Approved for Execution by The C. T. Co.
R. T. S., *Counsel.*

State of New York,
County of New York, ss.

On this 14th day of March, 1924, at New York City before me personally appeared Henry Monkley and James E. Diamond, to me known, who, being by me duly sworn, made oath that they are the president and secretary, Vice Pres. respectively, of The National Piston Company, Incorporated, the corporation described in and which executed the foregoing instrument, and are its agents for this purpose duly authorized, that they signed the same in behalf of said corporation, that the seal affixed to said instrument is the seal of said corporation

and was so affixed by authority of the Board of Directors; and they acknowledged the foregoing instrument to be their free act and deed and the free act and deed of said corporation.

ALPHONSO J. JAMES,
Notary Public.

(Notarial Seal)

Notary Public, New York County
New York Co. No. 87, Register No. 5065
Commission Expires March 30, 1925

STATE OF NEW YORK,
COUNTY OF WAYNE, ss.

On this 16th day of March, 1924, at Rochester, before me personally appeared Gustave E. Franquist, to me known, who being by me duly sworn made oath that he signed the foregoing instrument and he acknowledged the same to be his free act and deed.

JAY R. GELB,
Notary Public.

(Notarial Seal)

STATE OF NEW YORK,
COUNTY OF NEW YORK, ss.

On this 14 day of March, 1924, at New York City, before me personally appeared James E. Diamond, to me known, who, being by me duly sworn, made oath that he signed the foregoing instrument and he acknowledged the same to be his free act and deed.

ALPHONSO J. JAMES,
Notary Public.

(Notarial Seal)

Notary Public, New York County
New York Co. No. 87, Register No. 5065
Commission Expires March 30, 1925

STATE OF OHIO,
COUNTY OF CUYAHOGA, ss.

On this 11th day of March April, 1924, at Cleveland, Ohio, personally appeared before me R. A. Mahn and A. J. Perfler to me known to be respectively a vice-president and secretary Ass't Trust Officer of The Cleveland Trust Company, of Cleveland, Ohio, and acknowledged to me that they executed the foregoing instrument on behalf of said Company as Trustee, and for the uses and purposes therein set forth.

ROY F. HAGGERTY,
Notary Public.

PLAINTIFFS' EXHIBIT NO. 38e.

License Agreement between Kant-Skore Piston Company and The Cleveland Trust Company, dated April 11, 1924.

(Filed January 27, 1934.)

Apr 11 1924

AGREEMENT

THIS AGREEMENT made and entered into this 11th day of ~~March~~ April, 1924, by and between THE KANT-SKORE PISTON COMPANY, an Ohio Corporation of Cincinnati, Ohio, (hereinafter sometimes referred to as Kant-Skore) and THE CLEVELAND TRUST COMPANY of Cleveland, Ohio, a corporation of the State of Ohio, (hereinafter referred to as The Trust Company)

WITNESSETH:

WHEREAS, Kant-Skore owns the entire right, title and interest in and to United States Letters Patent

Hater 1,485,078 February 26, 1924.

and an application for United States Letters Patent, Serial No. 588,473, filed in the name of Hater.

WHEREAS, Kant-Skore desires, under certain conditions, to dispose of their interest in and to the said patents and in any other patents or applications for Letters Patent relating to pistons per se* which they may own wholly or in part, or subsequently acquire, and

WHEREAS, The Trust Company desires to obtain the entire right, title and interest in and to the said patents and the entire right, title and interest possessed by Kant-Skore in and to any other patents or applications relating to pistons per se now owned or subsequently acquired by Kant-Skore together with certain rights to past infringements of the said patent or patents and application or applications.

NOW, THEREFORE, in consideration of the covenants and agreements of the parties hereto, respectively as

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* Pistons per se means pistons whose patentability depends upon physical, structural characteristics of the piston and not upon the character of the material in the piston or the molds, machines or the processes by which the piston is made.

hereinafter set forth, said parties have covenanted and agreed, and do hereby covenant and agree with each other as follows:—

1. Kant-Skore agrees to sell, assign, transfer and set over to and hereby sells, assigns, transfers and sets over to The Cleveland Trust Company as trustee of a certain beneficial interest created by a certain Conveyance, Declaration of Trust and Agreement dated March 7th, 1922, copy of which is attached, marked "Exhibit A," * and another copy of which is on file with The Trust Company, the entire right, title and interest in and to United States Letters Patent, and applications enumerated above, and the entire right, title and interest possessed by Kant-Skore in and to any Letters Patent or applications for Letters Patent relating to pistons per se now owned, held, wholly or in part, on the date of the execution of this agreement or subsequently acquired; together with the right to sue for past infringements of the said patent or patents, or of any patent or patents issuing from such application or applications, and to collect damages and profits arising out of such infringement and apply the same to the benefit of The Cleveland Trust Company, as trustee. It is agreed that whatever right Kant-Skore now owns in or under the Spillman patent No. 1,325,176, December 16, 1919, is not transferred to The Trust Company by this agreement.

2. The Trust Company hereby agrees forthwith upon the execution of this agreement to issue in the name of and transfer to Kant-Skore fifty (50) shares in the beneficial interest created by and under said certain Conveyance, Declaration of Trust and Agreement, of which exhibit "A" is a copy.

3. Kant-Skore hereby agrees for itself, successors and its legal representatives to execute and deliver to The Cleveland Trust Company as Trustee any and all other papers or documents necessary or desirable more fully to convey to The Cleveland Trust Company, as Trustee, the entire right, title and interest in and to the said inventions, Letters Patent and applications and each of them hereby sold, assigned and transferred or intended so to be when, and as, the same may be requested

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*PRINTER'S NOTE:

The "Exhibit A" referred to above was not attached to Exhibit 38e.

by The Trust Company, as Trustee, its successors and assigns.

4. Kant-Skore hereby agrees to assign to The Cleveland Trust Company, as Trustee, without further consideration, the entire right, title and interest in and to any United States Letters Patent or application relating to pistons per se which it may in the future acquire forthwith upon obtaining the same together with whatever rights they may acquire to sue and collect for past infringement thereof and to apply any damages and profits so recovered to the benefit of The Cleveland Trust Company as trustee.

5. In case the sub-license from the Aluminum Company of America to the Kant-Skore Company, a copy of which is attached hereto, made a part hereof, and marked "Exhibit B," * is cancelled or terminated for any reason whatsoever, excepting the failure of Kant-Skore Company reasonably to comply with its obligations thereunder, and said Kant-Skore Company forthwith applies to whomsoever then holds or controls as owner or exclusive licensee, the inventions, applications for Letters Patent and Letters Patent embraced by such sub-license, for another sub-license upon terms at least as favorable for Kant-Skore Company as those in said sub-license "B" contained, and such owner or exclusive licensee as the case might be, fails to execute or deliver to Kant-Skore Company such a sub-license within thirty (30) days from the date of such application by said Kant-Skore Company, then and in that event, this agreement shall be deemed and construed henceforth to operate as such a sub-license having the terms and conditions of the sub-license, Exhibit "B," applicable for such purpose and Kant-Skore Company shall account thereunder directly to The Trust Company.

6. This agreement, in the construction of which the laws of the State of Ohio shall govern, is made by The Trust Company under title conveyed by or acquired under and subject to the terms, provisions and conditions of said certain Conveyance, Declaration of Trust and Agreement, of which exhibit "A" is a copy.

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*PRINTER'S NOTE:

The "Exhibit B" referred to above was not attached to Exhibit 38e.

In Witness Whereof the parties hereto have set their hand and affixed their seal this 11th day of April, 1924.

The Cleveland Trust Company,
By R. A. Malm,
Vice President.

Attest:

A. J. Perfler,
Ass't Trust Oficer.

The Kant-Skore Piston Company,
By H. J. Hater,
V. P.

Attest:

R. T. Mesker,
Secy.

Approved for Execution by The C. T. Co.
R. T. S., *Counsel.*

State of Ohio,
Cuyahoga County, ss:

On the 11th day of April, 1924, personally appeared before me, R. A. Malm and A. J. Perfler to me known to be respectively the vice president and secretary Ass't Trust Officer of The Cleveland Trust Company, of Cleveland, Ohio, and acknowledged to me that they executed the foregoing instrument on behalf of said company and for the uses and purposes set forth.

Roy F. Haggett,
(Notarial Seal) *Notary Public.*

State of Ohio,
County of Hamilton, ss:

On the 10th day of March, 1924, personally appeared before me H. J. Hater, and R. T. Mesker, to me known to be respectively the president and secretary of The Kant-Skore Piston Company, and acknowledged to me that they executed the foregoing instrument on behalf of said company and for the uses and purposes therein set forth.

David Lorbach,
(Notarial Seal) *Notary Public.*

PLAINTIFFS' EXHIBIT NO. 39a.

Letter from Aluminum Company of America to The Cleveland Trust Company, dated September 19, 1927.

(Filed January 27, 1934.)

Cleveland, Ohio, September 19, 1927.

The Cleveland Trust Company,
Trustee under Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922,
Cleveland, Ohio.

Gentlemen:

We hereby consent to your executing and carrying out the agreement dated October 12th, 1927, between The Cleveland Trust Company, Trustee, and Bohn Aluminum & Brass Corporation, which has been initialled by Mr. W. P. King, and the license agreement dated as of Oct. 12th as of Sept. 15th, 1927, between The Cleveland Trust Company, Trustee, as Licensor and Bohn Aluminum & Brass Corporation as Licensee, which has also been initialled by Mr. W. P. King,—it being understood that said license agreement is to be carried out according to the terms thereof and is not to be changed or modified without our consent; and provided that either the agreements between The Cleveland Trust Company and Walker M. Levett Company, et al., and The National Piston Company et al., respectively, each dated April 11, 1924, shall be surrendered and cancelled, or all rights under paragraph four of the former agreement and paragraph five of the latter agreement be waived and extinguished.

This letter of consent or authority to execute shall continue unless extended for a further period at that time, until thirty days from date hereof.

Very truly yours,

ALUMINUM COMPANY OF AMERICA,
By W. P. KING,
Vice-President.

PLAINTIFFS' EXHIBIT NO. 39b.

Letter from Aluminum Company of America to The Cleveland Trust Company, dated October 12, 1927.

(Filed January 27, 1934.)

Detroit, Mich., October 12, 1927.

The Cleveland Trust Company,
Trustee under Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922.
Cleveland, Ohio.

Gentlemen:

Supplementing our letter of September 19, 1927 to you, we beg to say that it is understood and we hereby agree, that in case we surrender the license heretofore granted to us by you under date of April 26, 1924, any re-assignment of the patents, patent applications or other patent rights which have been assigned by us to you under said license agreement, shall be made subject to the license granted by you to the Bohn Aluminum & Brass Corporation by the agreement ~~dated~~ executed this day ~~1927~~ between you and the Bohn Aluminum & Brass Corporation, the execution of which on your part we consented to in our letter of September 19th, 1927.

Very truly,

ALUMINUM COMPANY OF AMERICA,
By W. P. KING,
Vice President.

PLAINTIFFS' EXHIBIT NO. 39c.

License Agreement between The Cleveland Trust Company and Bohn Aluminum & Brass Corporation, dated September 15, 1927, with Lists A and B Attached.

(Filed January 27, 1934.)

LICENSE AGREEMENT

This License Agreement, made and entered into by and between THE CLEVELAND TRUST COMPANY, of Cleveland, Ohio, as Trustee under the Declaration of Trust and Agreement between L. P. Mooers et al. and The Cleveland Trust Company, dated March 7, 1922, hereinafter sometimes called the Licensor, and BOHN ALUMINUM & BRASS CORPORATION, a Michigan corporation of Detroit, Michigan, hereinafter sometimes called the Licensee, witnesseth:—

WHEREAS the Licensor owns the entire right, title and interest in and to the Letters Patent and applications for Letters Patent in the United States as set forth in List A, attached hereto, and has arranged to acquire the entire right, title and interest in and to the Letters Patent and applications set forth in List B, attached hereto; and

WHEREAS the Licensor may acquire other United States patents, patent applications and patent rights relating to pistons per se* during the life of this agreement; and

WHEREAS the said Licensee is desirous of acquiring a license to make, use and sell the inventions included in the said patents and applications acquired and to be acquired by the Licensor for the full term for which said patents are or shall be granted;

NOW, THEREFORE, in consideration of the premises and of the covenants and agreements of the parties hereto, respectively, as hereinafter set forth, said parties have covenanted and agreed, and do hereby covenant and agree with each other as follows:

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* Pistons per se means pistons whose patentability depends upon physical, structural characteristics of the piston and not upon the character of the material in the piston or the molds, machines or the processes by which the piston is made.

Amended—January 1, 1928

I

The Licensor grants the Licensee the non-exclusive right to make, use and sell a maximum of five million (5,000,000) pistons and/or piston castings per accounting year (each year beginning July 1st) embodying any of the inventions covered by any of the patents and applications in the above named lists, being all of the patents and applications for patents relating to pistons per se now owned by the Licensor, or to be covered by any continuations and divisions, renewals or reissues of the same, for the full term of each of said patents throughout the United States, the territories and possessions thereof. In case the Licensee makes and sells no so-called controlled type* pistons or castings which are, after sale, modified or to be modified into controlled type pistons, during any accounting year, the maximum of five million pistons and/or piston castings provided herein for that year is waived and the number of pistons and/or piston castings the licensee may make hereunder for that year is unlimited. This license and agreement will be automatically extended to cover any other and further patents or applications or other rights under patents which the Licensor may acquire relating to pistons per se, subject to the conditions imposed thereon when received by the Licensor, unless excluded therefrom by the Licensee as hereinafter provided, and the Licensor agrees to execute any further instruments and perform any further acts if any are required, to consummate the granting of such licenses to the Licensee.

II

The Licensor releases and discharges the Licensee, all its vendees and/or users of pistons, the castings for which were heretofore acquired from the Licensee, from any and all claims whatsoever for damages or profits by reason of any alleged past infringement of any of the patents in lists A and B hereto attached now owned by the Licensor and arising out of the manufacture, use and

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*By controlled type of aluminum piston is meant any piston made in any part of a light metal or of an alloy of a specific gravity less than iron or steel, the expansion and contraction of which is controlled to any extent by any other metal with a coefficient of expansion different from that of the said light metal or alloy.

sale of such pistons; and from any claim or claims for past damages or profits under patents which shall be acquired by the Licensor in the future, during the continuance of this agreement, and under which the Licensee shall accept a license hereunder, and theretofore arising out of the manufacture, use and sale of such pistons; and agrees not to institute or to aid or abet the institution of any suit against the Licensee, or the vendees or users of pistons, the castings for which were heretofore acquired from the Licensee, for any alleged past infringement of any patents relating to the subjects covered by the patents or applications named herein or for damages and profits because of alleged past infringement thereof and heretofore arising out of the manufacture, use and sale of such pistons.

III

1. (a) The Licensor shall institute and prosecute to a conclusion with due diligence suit or suits against any or all infringers of the patents included within the terms of this agreement necessary reasonably to protect the interests of the Licensee acquired hereunder, provided that the Licensor be indemnified to its satisfaction by the Licensee for any costs or expenses which the Licensor may suffer or sustain in connection with or growing out of any such suit.

(b) The Licensor shall defend any suit or suits, so far as such defense shall be necessary reasonably to protect the interests of the Licensee acquired hereunder, brought because of the alleged infringement of any Letters Patent covering the design of pistons made, sold or used under this agreement and for which royalties are paid under this agreement, provided that the Licensor be indemnified to its satisfaction by the Licensee for any costs or expenses which the Licensor may suffer or sustain in connection with or growing out of any such defense.

2. Should the Licensor bring and prosecute or defend as above provided such infringement suit or suits at its own expense, all profits or damages recovered in said suit or suits shall be the absolute property of the Licensor.

3. In the event of the failure of the Licensor promptly to institute and vigorously prosecute or to defend such suit or suits as may be necessary reasonably to protect the interests of the Licensee hereunder, then and in that event, the Licensee having reasonably in-

demnified the Licensor, may in the name of the Licensor or the names of the Licensor and Licensee jointly institute or adopt and diligently prosecute or defend at the Licensee's expense such suit or suits as may be required reasonably to protect its interests. The Licensor at any time shall have the right to join in the prosecution or defense of such suit or suits with its own counsel and at its own expense.

4. Should the Licensee bring or prosecute or defend as above provided any such infringement suit or suits or should the Licensee furnish indemnification to the Licensor in connection with suits brought or prosecuted or defended by the Licensor and pay any sum on account of such indemnification, it shall have the right to apply all royalties payable by it on the reasonable costs and expenses of such suit or suits, including attorney's fees, or on said sum paid on account of indemnification and shall apply the sum, if any, recovered in any such suit, first, to the reimbursement of it for said reasonable expenses and costs, including attorney's fees, or sums paid on account of indemnification, and not theretofore reimbursed to it out of royalties, and second, to the payment to the Licensor of all sums theretofore deducted by the Licensee from royalties and applied to the said reasonable costs and expenses, including attorney's fees, of such suit or payments of indemnification, and the balance shall be the absolute property of the Licensee.

IV

The Licensee agrees that it will within the months of January, April, July and October of each year from and after the execution hereof, furnish to the Licensor, its successors or assigns in interest, a written statement under oath which shall show:—

(a) the number of pistons and piston castings made by or for it or imported by it, and used, sold* or otherwise disposed of by it during the preceding three calendar months, which contain or which to the Licensee's knowledge are to be modified or fabricated by the Licensee's vendees to contain and embody any invention covered by any of the claims of any of the Letters Patent and applications recited in Lists A and B hereto attached, or in the future acquired by the Licensor and included herein.

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*Sold in this contract means and includes only licensed pistons which are delivered during the period.

This report shall be made whether or not the Licensee makes, uses or sells any pistons and/or castings therefor during the preceding royalty period.

(b) the number of controlled type pistons and castings for controlled type pistons made by or for it or imported by it, and used, sold or otherwise disposed of by it during the preceding three calendar months.

This report shall be made whether or not the Licensee makes, uses or sells any controlled type pistons and/or castings therefor during the preceding royalty period.

(c) the number of such pistons and piston castings sold by the Licensee and for which the vendee has been subsequently credited.

The first report shall include the pistons and/or piston castings covered by this Article, used, sold or otherwise disposed of between ~~the date of this contract~~ September fifteenth and October 1, 1927.

Alteration (OK)
B. A. & B. Corpn. PAM
The C. T. Co.—AJP
A. Co. of Am.—WPK

V

The Licensee will pay the Licensor a royalty of one cent (1¢) upon each piston used, sold or otherwise disposed of by the Licensee during the life of this agreement, embodying in its construction any invention covered by one or more of the claims of the Letters Patent and applications named in Lists A and B attached hereto, or in the future acquired by the Licensor and added hereto, and upon each piston casting sold or otherwise disposed of by the Licensee with the intention or the knowledge of the Licensee that it shall be modified or fabricated by the Licensee's vendee in such way as to embody in its construction any invention covered by one or more of the claims in the said Letters Patent or applications.

It is understood that no royalties will be payable or collectible upon the licensed pistons or piston castings which have been sold and for which the vendee thereof has been subsequently credited, and that if any royalties have been paid upon the licensed pistons or piston cast-

ings which are sold, and for which the vendee has been subsequently credited, the Licensee shall have credit therefor upon the next due payment.

VI

For the purpose of the interpretation of the provisions of this agreement, it is agreed that the commercial controlled type pistons heretofore manufactured, or for which castings have heretofore been manufactured, by Bohn Corporation and Aluminum Company of America, are covered by claims of the patents included in Lists A and B hereto attached.

VII

Within thirty (30) days after it shall have furnished, in January, April, July and October of each year, the statements specified in Article IV hereof, the Licensee shall and will pay to the Licensor, its successors or the assigns of its interest in said Letters Patent, the royalties upon the pistons and piston castings covered by said reports, at the rate prescribed.

VIII

The Licensee agrees that it will keep accurate books of account, giving full particulars of the Licensee's business with respect to the licensed pistons and piston castings covered by this agreement and will admit the Licensor or its duly accredited agent at all reasonable times to inspect the same.

IX

In the event that the combination set forth in any of the claims of the Letters Patent shown in Lists A and B hereto attached or of the applications for Letters Patent shown in said lists A and B and of the Letters Patent to be granted on said applications, and/or acquired in the future and added hereto, is held by a court of final jurisdiction or by an inferior court from whose decree no appeal is taken or the appeal is denied or dismissed, to be an infringement of any other patent (other than patents owned by the Licensee or under which the Licensee is licensed) in any patent suit brought in the United States against the Licensor, the Licensee, any other of the Licensor's licensees, any sub-licensees or any of its or their vendees, the Licensee shall have, and is hereby given, the right and option to exclude from this license

any such claim or claims or the Letters Patent or applications for Letters Patent containing such claim or claims, as the case may be, and to have the royalty payable hereunder reduced proportionately to the reduction, if any, caused by such judicial holdings, in the value of the patents and applications comprehended by this agreement, such proportion to be determined by arbitration as hereinafter in Paragraph XVIII hereof provided, or to terminate this agreement altogether, by giving to the Licensor notice in writing of its election so to do within six (6) months from the rendition of the judicial holding of the court of final jurisdiction or after the expiration of the time for appeal or after the appeal has been denied or dismissed.

X

This agreement and license shall be transferable only to the successors or assigns of the entire casting business of the Licensee or the entire business of either of the parties hereto, but in that event the successors or assigns shall be bound by the provisions of this agreement and obligated to conform thereto; provided, however, that any successor to The Cleveland Trust Company, as Trustee under said Declaration of Trust and Agreement, dated March 7, 1922, shall be deemed, for the purposes hereof, to be the successor and assign of the entire business of the Licensor.

XI

The Licensee will not during the life of this agreement contest, or aid others in contesting, the scope or validity of any of the Letters Patent included within this agreement or afterwards acquired by the Licensor and included in this agreement.

XII

The Licensee hereby is given the right and option to exclude from this license any Letters Patent or applications for Letters Patent or other patent rights which the Licensor may acquire after the execution of this license, provided the Licensee gives the Licensor notice in writing of such exclusion within ninety (90) days after notice in writing to the Licensee by the Licensor of the acquisition of such Letters Patent or applications or other patent rights.

XIII

The Licensee shall pay royalties only upon pistons and piston castings delivered during the term of this license.

XIV

If either of the parties hereto neglects or refuses to keep any of its covenants herein, then the other party hereto may serve on the derelict party by registered mail a notice in writing of such default and if the derelict party shall continue such default for thirty (30) days after the serving of such notice, then the aggrieved party may at its option cancel this license by a notice in writing of such cancellation and termination, provided, however, that the foregoing remedy shall not exclude any other remedy which the aggrieved party may have at law or in equity. The waiver of any breach by either party shall not be interpreted as constituting a waiver of any further breach or breaches.

XV

The Licensor hereby grants to the Licensee the right to make, use and sell in the United States pistons embodying the inventions covered by any foreign patents or applications for foreign patents, which the Licensor now owns or controls, or in the future acquires, for sale and use in foreign countries covered by said patents and/or applications. The Licensor releases the Licensee, its vendees and all users of its pistons, from any claim or claims for alleged infringement of foreign patents, which the Licensor now has or in the future may acquire and under which the Licensee may accept a license as herein provided. The Licensor agrees, upon demand of the Licensee, to execute all instruments and perform all acts necessary to grant the licenses under this paragraph. This license and agreement will be automatically extended to cover pistons under any other and further foreign patents or applications for foreign patents or other rights under foreign patents on pistons per se which the Licensor may acquire in the future, unless excluded therefrom by the Licensee as provided for in this contract and the Licensor agrees to execute any further instruments and perform any further acts, if any are required, to consummate the granting of licenses to the Licensee under this section of this agreement.

XVI

The Licensee shall use reasonable diligence in manufacturing and/or marketing pistons embodying inventions, licensed hereunder, and, in the event that, during the continuance of this agreement, it should not do so, the Licensor shall have the following right, option and privilege exercisable by it forthwith upon the finding by arbitration as hereinafter provided that the Licensee has not used and is not using such diligence:

(a) To cancel or terminate this agreement by giving six (6) months' notice in writing to the said Licensee of its desire and intentions so to do; whereupon at the expiration of said six (6) months from the date of said notice this agreement shall be terminated.

XVII

Should the Licensee, taking advantage of its privilege under any of the provisions of this contract, elect to terminate this contract and stand out from under the same, the Licensee shall not be estopped to deny the validity of any of the patents covered or comprehended by this contract and shall not be deprived of any of the defenses or the rights of a defendant in an ordinary patent infringement suit, but, on the contrary, shall stand in the position of one who had never entered into this contract.

XVIII

In the event either party hereto calls for an arbitration as provided for in this contract, each party shall select an arbitrator and the two arbitrators shall select a third arbitrator. In the event that the two arbitrators fail to select a third or in the event either party fails to select its arbitrator, it is agreed that the third and/or second arbitrator may be selected by the district judge of the United States District Court, Northern District of Ohio, Eastern Division, who has then been longest in said office. The three arbitrators thus selected shall constitute the Board of Arbitration and the parties hereto shall submit their contentions to this Board of Arbitration at a time and in a manner determined by the arbitrators. The decision of any two arbitrators shall be final and binding on the parties hereto. Each party shall bear the expense of its arbitrator and both shall bear the expense of the third arbitrator share and share alike.

XIX

The Licensor agrees that should it at any time during the life of this agreement grant licenses under the patents, now included, or in the future included, in this agreement, or under the substantial and material patents now included or to be included in this agreement, at lower rates than one cent ($.01) per piston as provided for herein, or otherwise upon more favorable terms than are provided for herein, then, upon request of Licensee, this agreement shall be modified to make its terms as favorable as those upon which any such subsequent license may be granted.

XX

Amended—January 1, 1928

Except as otherwise provided in Article I hereof, this licensee is limited to five million (5,000,000) pistons and piston castings (together) per accounting year. If the Licensee exceeds that amount in any accounting year without the written consent of the Licensor, and of the Licensor's other licensee (being the exclusive licensee except for this license) under the patents held in the Licensor's trust estate, then the Licensor shall charge and collect an additional royalty of ten cents (10¢) per piston for all pistons and piston castings in excess of the maximum five million (5,000,000), which additional royalty shall be paid by the Licensee to the Licensor on demand, and the Licensor shall diligently proceed by proper proceedings to enjoin and prevent any further such violation of the provisions of this license, or, failing so to enjoin and prevent such violation, the Licensor shall cancel this license.

XXI

This agreement is made by the Licensor under title conveyed by or acquired under and subject to the terms, provisions and conditions of a certain Conveyance, Declaration of Trust and Agreement entered into as of the 7th day of March, 1922, by and between Louis P. Mocers and George B. Pitts and The Cleveland Trust Company, Trustee, the Licensor herein, a copy of which is on file at the principal office of said The Cleveland Trust Company in the City of Cleveland, and open to the inspection of the Licensee, and unless terminated as hereinbefore provided, shall terminate with the date of expiration of the last Letters Patent now or hereafter embraced in said Declaration of Trust and Agreement.

XXII

Upon the execution and delivery hereof, Bohn Corporation shall surrender and cancel all of the Sub-licenses under the patents held by the Trust Company which said Bohn Corporation or any of its subsidiary or affiliated companies own.

XXIII

The non-exclusive license granted by this agreement does not convey to the Licensee any rights to grant any sub-licenses thereunder.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed in duplicate by their respective officers thereunto duly authorized October 12, 1923 as of the 15th day of September, A. D. 1927.

BOHN ALUMINUM & BRASS CORPORATION,
By P. A. MARKEY,
Vice-President,
R. T. G.

A. P. LAUER,
Secretary.
(Corporate Seal)

THE CLEVELAND TRUST COMPANY, TRUSTEE,
By R. A. MALM,
Vice-President,

A. J. PERFLER,
Assistant Trust Officer.
(Corporate Seal)

Approved for Execution by The C. T. Co.
R. T. S., *Counsel.*

STATE OF OHIO,
COUNTY OF CUYAHOGA, ss.:

On the 11th day of October, 1927, personally appeared before me R. A. MALM and A. J. PERFLER, to me known to be, respectively, the Vice-President and Assistant Trust Officer of The Cleveland Trust Company, and acknowledged to me that they executed the foregoing instrument on behalf of said Trust Company, as Trustee, and for the uses and purposes therein set forth.

ELMER L. HAHN,
Notary Public.

STATE OF MICHIGAN,
COUNTY OF WAYNE, SS.:

On the 12th day of October, 1927, personally appeared before me P. A. MARKEY and A. P. LAUER, to me known to be, respectively, the Vice-President and Secretary of the Bohn Aluminum & Brass Corporation, and acknowledged to me that they executed the foregoing instrument on behalf of said company and for the uses and purposes therein set forth.

F. MILFORD TAYLOR,
Notary Public.

My Commission Expires Mar. 21, 1930.

Z

LIST A

Patent Number	*Patentee*	*Date*
Re 16,273	R. M. Howdeshell	Feb. 23, 1926
1,092,870	Spillman & Mooers	Apr. 14, 1914
1,153,902	G. E. Franquist	Sept. 21, 1915
1,279,184	J. G. Vincent	Sept. 17, 1918
1,293,846	H. C. Marmon	Feb. 11, 1919
1,327,147	H. D. Church	Jan. 6, 1920
1,371,320	C. A. Marien	Mar. 15, 1921
1,347,819	L. P. Mooers	July 27, 1920
1,388,279	C. A. Marien	Aug. 23, 1921
1,402,308	L. P. Mooers	Jan. 3, 1922
1,402,309	L. P. Mooers	Jan. 3, 1922
1,408,066	W. B. & M. Berry	Feb. 28, 1922
1,473,233	R. M. Howdeshell	Nov. 6, 1923
1,551,233	W. G. Berry, et al.	Aug. 25, 1925
1,563,025	H. J. Hater	Nov. 24, 1925

Serial No.	*Applicant*	*Filing Date*
563,782	Gustave E. Franquist	May 26, 1922
88,706	Stephen D. Hartog	Feb. 16, 1926
100,496	Harold J. Ness	Apr. 8, 1926
100,497	Harold J. Ness	Apr. 8, 1926
133,909	William C. McCoy	Sep. 7, 1926
143,878	William C. McCoy	Oct. 25, 1926
143,879	William C. McCoy	Oct. 25, 1926
467,587	Stephen D. Hartog	May 7, 1921
470,502	Gustav R. Kelm	May 18, 1921 Renewed Sep. 15, 1923
561,997	James E. Diamond	May 18, 1922
649,481	Louis P. Mooers	July 5, 1923
204,661	Edward J. Gulick	Nov. 30, 1917

LIST B

Inventor	*Patent Number*	*Date*
Wasson	1,320,188	10-28-19
Napier	1,403,560	1-17-22
Parkhurst	1,440,549	1- 2-23
Wills	1,441,468	1- 9-23
Pomeroy	1,499,073	6-24-24
Napier	1,525,316	2- 3-25
Jardine	1,563,194	11-24-25
Jardine & Jehle	1,589,491	4-13-26

Applicant	*Serial Number*	*Filing Date*
Jardine	450,898	3- 9-21
Jehle & Jardine	544,487	3-17-22
Jardine & Jehle	615,324	1-27-23
Welty	39,676	6-26-25
Jardine	47,214	7-31-25
Welty	47,220	7-31-25
Jardine	47,234	7-31-25
Norton	51,748	8-22-25
Jardine	57,838	9-22-25
Jardine	79,527	1- 6-26
Jardine & Cooper	79,651	1- 6-26
Jardine & Cooper	79,800	1- 7-26
Welty	80,173	1- 9-26
Norton	80,902	1-13-26
Evans	84,894	1-30-26
Jardine	100,771	4- 9-26
Jardine	100,772	4- 9-26
Jardine	100,773	4- 9-26
Jardine	100,774	4- 9-26
Welty	128,764	8-12-26
Jardine	137,194	9-23-26
Jardine & Cooper	174,202	3-10-27
Norton	Docket No. 2799 being prepared	
Welty	Docket No. 2834 being prepared.	

PLAINTIFFS' EXHIBIT NO. 39d.

Letter from Aluminum Company of America to The Cleveland Trust Company, dated September 19, 1927.

(Filed January 27, 1934.)

ALUMINUM COMPANY OF AMERICA

Warren P. King
Vice-President

Cleveland, O., September 19, 1927.

The Cleveland Trust Company, Trustee
under Declaration of Trust between
L. P. Mooers et al., dated March 7,
1922,
Cleveland, Ohio.

Gentlemen:

We beg to advise that we recognize that the commercial controlled type pistons heretofore manufactured, or for which castings have heretofore been manufactured, by us, are covered by claims of one or more of the patents included in lists A and/or B attached hereto.

Very truly yours,

ALUMINUM COMPANY OF AMERICA,
By W. P. KING,
Vice-President.

P:L

PRINTER'S NOTE:

Lists A and B, attached to the original hereof, having been printed as part of Plaintiffs' Exhibit No. 39c, *supra*, have been omitted at this point to comply with the rule against duplication.

PLAINTIFFS' EXHIBIT NO. 39e.

Letter from Aluminum Company of America to The Cleveland Trust Company, dated April 26, 1928.

(Filed January 27, 1934.)

Cleveland, Ohio, April 26, 1928.

The Cleveland Trust Company,
Trustee under Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922,
Cleveland, Ohio.

Gentlemen:

We hereby consent to your executing the Amendment to the License Agreement between The Cleveland Trust Company, Trustee, Licensor, and Bohn Aluminum and Brass Corporation, Licensee, dated as of January 1, 1928, but made April 25, 1928, which has been signed by the officers of Bohn Aluminum and Brass Corporation and acknowledged by them under date of April 14, 1928, it being understood that he License Agreement executed on October 12, 1927, as of September 15, 1927, between The Cleveland Trust Company, Trustee, as Licensor, and Bohn Aluminum and Brass Corporation as Licensee, as amended by the said Amendment thereto hereinabove mentioned, is to be carried out according to the terms thereof and is not to be further changed or modified without our consent.

Very truly yours,

ALUMINUM COMPANY OF AMERICA,
By W. P. KING,
Vice-President.

P:L

PLAINTIFFS' EXHIBIT NO. 39f.

(Defendants' Exhibit 4-U.)

License Agreement between The Cleveland Trust Company and Bohn Aluminum & Brass Corporation.

(Filed January 27, 1934.)

LICENSE AGREEMENT

THE CLEVELAND TRUST COMPANY

TO

BOHN ALUMINUM AND BRASS CORPORATION

October 12, 1927

Amended—Jan. 1, 1928

Amended—Dec. 24-1929

THIS AGREEMENT, made and entered into as of on the 25th day of April, 1928, as of the first day of January 1928 by and between THE CLEVELAND TRUST COMPANY, of Cleveland, Ohio, as Trustee under the Declaration of Trust and Agreement between L. P. Mooers *et al.* and The Cleveland Trust Company, dated March 7, 1922, hereinafter sometimes called the "Licensor," and BOHN ALUMINUM AND BRASS CORPORATION, a Michigan corporation, of Detroit, Michigan, hereinafter sometimes called the "Licensee,"

WITNESSETH:

WHEREAS said The Cleveland Trust Company, as Trustee as aforesaid, and the Bohn Aluminum and Brass Corporation heretofore entered into a certain License Agreement, executed on the 12th day of October, 1927, as of the 15th day of September, 1927, wherein said Trust Company, as said Trustee, is Licensor and the Bohn Aluminum and Brass Corporation is Licensee; and

WHEREAS the parties thereto desire to modify and amend said License Agreement as hereinafter provided;

NOW, THEREFORE, it is agreed by and between the parties hereto,—each party hereto making its promises and agreements herein contained in consideration of the promises and agreements of the other party herein contained,—as follows, to wit:

1. The first two sentences of Article I of the said License Agreement, executed October 12, 1927, as of September 15, 1927, are hereby modified and amended so as to read as follows:

The Licensor grants the Licensee the non-exclusive right to make, use and sell a maximum of ten million (10,000,000) pistons and/or piston castings per accounting year (each year beginning January 1st) embodying any of the inventions covered by any of the patents and applications in the above named lists, being all of the patents and applications for patents relating to pistons per se now owned by the Licensor, or to be covered by any continuations and divisions, renewals or reissues of the same, for the full term of each of said patents throughout the United States, the territories and possessions thereof. In case the Licensee makes and sells no so-called controlled type* pistons or castings which are, after sale, modified or to be modified into controlled type pistons, during any accounting year, the maximum of ten million pistons and/or piston castings provided herein for that year is waived and the number of pistons and/or piston castings the licensee may make hereunder for that year is unlimited.

2. Article XX of the said License Agreement, executed October 12, 1927, as of September 15, 1927, is hereby modified and amended so as to read as follows:

Except as otherwise provided in Article I hereof, this license is limited to ten million (10,000,000) pistons and piston castings (together) per accounting year. If the Licensee exceeds that amount in any accounting year without the written consent of the Licensor, and of the Licensor's other licensee (being the exclusive licensee except for this license) under the patents held in the Licensor's trust estate, then the Licensor shall charge and collect an additional royalty of ten cents (10¢) per piston for all pistons and piston castings in excess of the maximum ten million (10,000,000), which additional royalty shall be paid by the Licensee to the Licensor on demand, and the Licensor shall diligently proceed by proper proceedings to enjoin and prevent any further such violation of the provisions of this license, or, failing

*By controlled type of aluminum piston is meant any piston made in any part of a light metal or of an alloy of a specific gravity less than iron or steel, the expansion and contraction of which is controlled to any extent by any other metal with a coefficient of expansion different from that of the said light metal or alloy.

so to enjoin and prevent such violation, the Licensor shall cancel this license.

3. Except as hereinabove otherwise specifically provided, the said agreement executed October 12, 1927, as of September 15, 1927, shall remain unchanged and in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed in duplicate by their respective officers thereunto duly authorized as of the day and year first above written.

BOHN ALUMINUM AND BRASS CORPORATION,
By P. A. MARKEY,
Vice-President.

S. D. DEN UYL,
Ass't Secretary.

THE CLEVELAND TRUST COMPANY, *Trustee,*
By R. A. MALM,
Vice-President.

A. J. PERFLER,
Assistant Trust Officer.

Approved for execution by the C. T. Co.
A. J. P., *Ass't Counsel.*

STATE OF OHIO }
COUNTY OF CUYAHOGA } ss:

On the 25th day of April, 1928, personally appeared before me R. A. MALM and A. J. PERFLER, to me known to be, respectively, the Vice-President and Assistant Trust Officer of The Cleveland Trust Company, and acknowledged to me that they executed the foregoing instrument on behalf of said Trust Company, as Trustee, and for the uses and purposes therein set forth.

ELMER L. HAHN,
Notary Public.

(Notarial Seal)

My commission expires August 5th, 1930.

STATE OF MICHIGAN }
COUNTY OF WAYNE } ss:

On the 14th day of April, 1928, personally appeared before me P. A. MARKEY and S. D. DEN UYL, to me known to be, respectively, the Vice-President and Ass't Secretary of the Bohn Aluminum and Brass Corporation, and acknowledged to me that they executed the foregoing instrument on behalf of said Company and for the uses and purposes therein set forth.

F. MILFORD TAYLOR,
Notary Public.

(Notarial Seal)

My commission expires Mar. 21, 1930.

PLAINTIFFS' EXHIBIT NO. 39g.

Letter from Aluminum Company of America to The Cleveland Trust Company, dated December 24, 1929.

(Filed January 27, 1934.)

Cleveland, Ohio, December 24, 1929.

The Cleveland Trust Company, Trustee
under Declaration of Trust and Agreement between L. P. Mooers *et al.*,
dated March 7, 1922,
Cleveland, Ohio.

Gentlemen:

We hereby consent to your licensing Bohn Aluminum & Brass Corporation to make, use and sell a maximum of Eleven Million (11,000,000) pistons and/or piston castings during the accounting year beginning January 1, 1929, and ending December 31, 1929, under the License Agreement dated September 15, 1927, and actually executed October 12, 1927, between you as Licensor and Bohn Aluminum and Brass Corporation as Licensee, as amended by Agreement made on April 25, 1928, as of January 1, 1928, (being One Million (1,000,000) pistons and/or piston castings more than provided in said Agreement as so amended) it being understood that all other terms and provisions of said License Agreement as amended on April 25, 1928, shall be and remain in full force and effect and that the said One Million (1,000,000) increase in the number of licensed pistons and/or piston castings applies to said accounting year 1929 only, and that the maximum number of licensed pistons and/or piston castings for each accounting year subsequent to the said accounting year 1929 shall be Ten Million (10,000,000), and that the said license Agreement executed on October 12, 1927, as of September 15, 1927, between you as Licensor and Bohn Aluminum & Brass Corporation as Licensee, as amended by the said Agreement made April 25, 1928, as of January 1, 1928, except as to the said increase of One Million (1,000,000) in the number of pistons and/or piston castings licensed for the year 1929, is to be carried out according to the terms thereof and is not to be further changed or modified without our consent.

Very truly yours,

ALUMINUM COMPANY OF AMERICA,

By W. P. KING,

Vice-President.

PLAINTIFFS' EXHIBIT NO. 40.

Agreement between Bohn Aluminum & Brass Corporation and The Cleveland Trust Company, dated October 12, 1927, Under Schmiedeknecht Patent No. 1,256,265.

[Offered also as Defendants' Exhibit 4-V.]

(Filed September 27, 1934.)

AGREEMENT

THIS AGREEMENT made and entered into this 12th day of October, 1927, by and between the BOHN ALUMINUM & BRASS CORPORATION, a Michigan corporation, of Detroit, Michigan, hereinafter sometimes called the "Bohn Corporation," and THE CLEVELAND TRUST COMPANY, an Ohio corporation, of Cleveland, Ohio, as Trustee under the Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922, hereinafter sometimes called the "Trust Company,"

WITNESSETH:

WHEREAS the Bohn Aluminum & Brass Corporation owns the entire right, title and interest in and to United States Letters Patent No. 1,256,265, issued to Victor E. Schmiedeknecht on February 12, 1918, and an application for United States Letters Patent, Serial No. 201650, filed in the name of Frank J. Kent, both of which are for certain inventions relating to pistons per se*; and

WHEREAS the Bohn Corporation is a large manufacturer of aluminum pistons; and

WHEREAS the Trust Company, as Trustee as aforesaid, owns various patents relating to pistons per se; and

WHEREAS the Trust Company, as Trustee as aforesaid, desires to obtain the patent and the application for patent above named and to have the said Bohn Corporation accept a license under the patents in said trust estate, relating to pistons per se, by the terms of which said Bohn Corporation recognizes said patents and agrees to pay one cent (1¢) per piston royalty upon the pistons and/or castings therefor, made, used and/or sold by it, which are covered by said patents, or any of them; and

---

* Pistons per se means pistons whose patentability depends upon physical, structural characteristics of the piston and not upon the character of the material in the piston or the molds, machines or the processes by which the piston is made.

WHEREAS said Bohn Corporation is willing to sell and assign to said Trust Company, as Trustee as aforesaid, the patent and the application for patent above named and to accept a license from said Trust Company upon the terms and conditions hereinafter provided for;

NOW, THEREFORE, it is agreed by and between the parties hereto, each party hereto making its promises and agreements herein contained in consideration of the promises and agreements of the other party herein contained —each of said promises and undertakings being material and dependent—as follows, to wit:

1. Said Bohn Corporation agrees to sell, assign, transfer and set over and hereby sells, assigns, transfers and sets over to The Cleveland Trust Company, as Trustee under the Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922, the entire right, title and interest in and to the United States Letters Patent No. 1,256,265 and in and to the application for United States Letters Patent, Serial No. 201650, named above, together with the right to sue for past infringements of the said patent or of any patent issuing from such application, and to collect damages and profits arising out of such infringement and apply the same to the benefit of The Cleveland Trust Company, as Trustee.

2. The Trust Company hereby agrees forthwith upon the execution of this agreement to issue and deliver to said Bohn Corporation or its nominees or assigns, fully paid, One Thousand Five Hundred and Twelve and One-half (1512½) shares of the piston patent estate created by the said Trust Agreement dated March 7, 1922, between the Trust Company and L. P. Mooers et al., there being issued and outstanding at the date of the execution of this agreement Three Thousand (3000) of such shares, exclusive of the One Thousand Five Hundred and Twelve and One-half (1512½) shares so to be issued to said Bohn Corporation or its nominees or assigns.

3. Said Trust Company and said Bohn Corporation agree, forthwith upon the execution hereof, to execute the license agreement, a copy of which is hereto attached.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals to duplicates hereof the day and year first above written:

BOHN ALUMINUM & BRASS CORPORATION,
By P. A. MARKEY,
Vice-President.

Attest: A. P. LAUER,
Secretary.
(Corporate Seal)

THE CLEVELAND TRUST COMPANY, TRUSTEE,
By R. A. MALM,
Vice-President.

Attest: A. J. PERFLER,
Assistant Trust Officer.
(Corporate Seal)

Approved for Execution by The C. T. Co.
R. T. S., *Counsel.*

STATE OF MICHIGAN,
COUNTY OF WAYNE, ss:

On the 12th day of October, 1927, personally appeared before me P. A. Markey and A. P. Lauer, to me known to be, respectively, the Vice-President and the Secretary of the Bohn Aluminum & Brass Corporation, and acknowledged to me that they executed the foregoing instrument on behalf of said company and for the uses and purposes therein set forth.

SIMON D. DEN UYL,
(Notarial Seal) *Notary Public.*

My Commission Expires May 17, 1929.

STATE OF OHIO,
COUNTY OF CUYAHOGA, ss:

On the .... day of August, 1927, personally appeared before me R. A. Malm and A. J. Perfler, to me known to be, respectively, the Vice-President and Assistant Trust Officer of The Cleveland Trust Company of Cleveland, Ohio, Trustee under the Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922, and acknowledged to me that they executed the foregoing instrument on behalf of said company, as said Trustee, and for the uses and purposes therein set forth.

ELMER L. HAHN,
(Notarial Seal) *Notary Public.*

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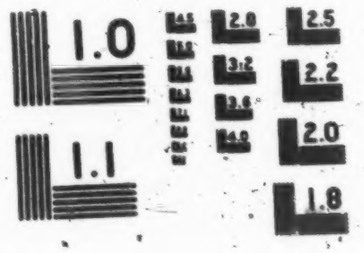


PLAINTIFFS' EXHIBIT NO. 42a.

Franklin Weekly Engineering Report, for the Week Ending October 5, 1918.

(Filed January 27, 1934)

MECHANICAL LABORATORY

ML4U—10000 Mile Wear Test

This engine has been built up again and the test has proceeded 8500 miles and will continue on to completion at intervals between our Government work when men are available for attendance.

ML20M—Piston Endurance Runs

Special Long patented aluminum composition pistons. Weight including wrist pin, 2 pressure proof jr. rings, and one Inland top ring—1.225#.

A full set of these pistons were installed in a regular series nine engine and fitted to the cylinders such that the straight skirt clearance from just below the wrist pin down was from .002" to .003". The lands were all .025" clearance just as they were received. It may be noted that there was four oil holes in the top of each wrist pin boss and also eight oil holes just below the lower ring. The engine, thus built up, was placed on dynamometer #2, fitted with tinware as in a car and the test was carried out according to the method described in ML20M so that results are comparable with those in that report.

In this last test the pistons were installed in such a way that the ribless side was toward the exhaust side of the engine.

Result; After 10 minutes running, pistons #4 and 6 seized on the exhaust (ribless) side of the piston.

This test will be repeated with the same style of pistons having a straight skirt clearance of .005" and having the ribless side of piston toward the suction side of the engine. To build up the motor in this way and not be obliged to cut away the rib in order to make room for the connecting rod cap screw, the connecting rods will be turned, through 180° and thus have their cap screw on the suction side.

LONG PATENT PISTON—PURCHASE ORDER #35509—TYPE "B."

250 of these from pattern X-13 are on order at Walker M. Levett Co. To date fourteen of these have been duly received. We are advised that shipment has been made of an additional fifty castings.

TYPE "A."

One hundred and sixty castings have been received of our original order calling for 350 castings from our type "A" pattern #P-2912. After receiving 65 castings we recalled pattern back from Walker-Levett Co. This to enable bringing pattern up to latest blue print. Upon completion same will be returned them for the completion of our order.

SHIPMENTS.

6 Long patent pistons type "A" equipped with rings and wrist pins have been forwarded to our Detroit dealer, Mr. W. J. Doughty.

PLAINTIFFS' EXHIBIT NO. 42b.

Franklin Weekly Engineering Report, for the Week Ending July 20, 1918.

(Filed January 27, 1934.)

ML20N—PISTON ENDURANCE RUNS

A regular series nine engine was equipped as follows; (a) New production gauge cylinders, (b) #1 cylinder was equipped with Long patent piston with no rib on suction side, (c) other pistons were regular production magnalite having a clearance of .013" for a distance of 1⅛" below the bottom ring and then tapering off to .003" at the skirt.

The engine was then placed on dynamometer #1 and motored in for three hours at 1000 R.P.M. Jackets were installed and a piston endurance run was made under the conditions described in report ML20M.

The run proceeded for 19 minutes when the power failed, thus taking the load off the engine. The horsepower had not dropped sufficient to indicate a "set up."

After allowing the engine to cool off to room temperature a second trial was made and this time the run proceeded for 19 minutes when the motor set up suddenly. #1 special piston set up so tightly and there was a large hole in the top of the piston. Two of the other pistons seized slightly on the exhaust side near the skirt.

PLAINTIFFS' EXHIBIT NO. 42c.

Franklin Weekly Engineering Report for the Week Ending May 3, 1919.

(Filed January 27, 1934.)

MECHANICAL LABORATORY.

ML 4X 10000 MILE WEAR TEST.

The Long Patent pistons with floating wrist pins and straight .003" clearance did not show excessive wear but one piston broke at 75000 miles and the retaining buttons in wrist pin holes had all worked loose, wearing down both the button and the wrist pin hole. One button was broken and one had the horizontal retaining lugs entirely worn away.

The electric welded cylinder did not show any excessive wear nor evidence of failing where it had been welded. This sample was returned to Mr. Babcock.

Practically no carbon was found in spark plug holes where the threads had been undercut.

The valve lifters with same grinding area as S-5 were in good condition after a total of 15000 miles. Some of the lifters showed scarcely any wear from the action of the cams and none showed excessive wear on the lifting surface. Further work will be done along this line. See tables for wear on wrist pins and wrist pin holes in pistons and connecting rods.

ML4X

Piston Wear in Thousandths of an Inch After 10000 Miles

Long Patent Pistons (R) with Floating Wrist Pins

No			Top	Between 1st & 2nd Ring	Below 3rd Ring	Below Wrist Pin	Skirt
1	a		Not Pistons broke at 7500 miles				
	b						
2	a		1	0	7	4	4
	b		2	.5	6	4	2
3	a		0	0	5	4	3
	b		1	0	3.5	2.5	2.5
4	a		0	0	5	3.5	3.5
	b		3.5	1.5	2.5	.5	1.5
5	a		1	0	6	4	4
	b		4.5	1.5	6	3.5	3
6	a		4	3	7	3.5	4
	b		1	0	1.5	3	4
Averages	a		1.2	.6	6.4	3.8	3.7
	b		2.4	.7	3.9	2.7	2.8

ML 4X

Floating Wrist Pins

WEIGHT TO BE MADE IN THROUGHOUT AFTER 10000 MILES

I

CYL. NO.	END	MIDDLE	END
1	Cracked at 7500 miles		
2	1	0	1
3	2	.5	2
4	1	0	1
5	1	0	.75
6	1	0	.5
AVERAGE	1.2	.1	1.25

WEIGHT IN THROUGHOUTS AS WEIGHT TO BE MADE IN BEARING AFTER 10000 MI.

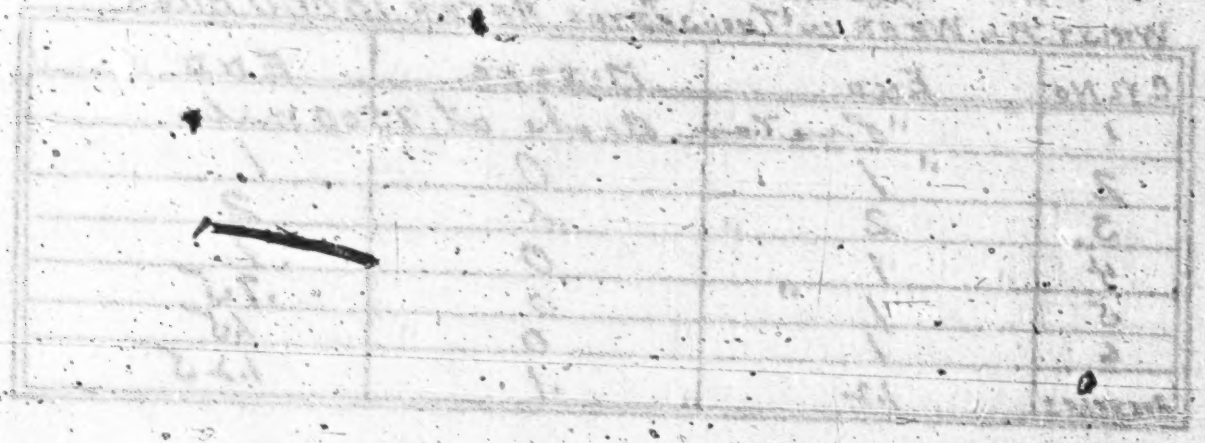
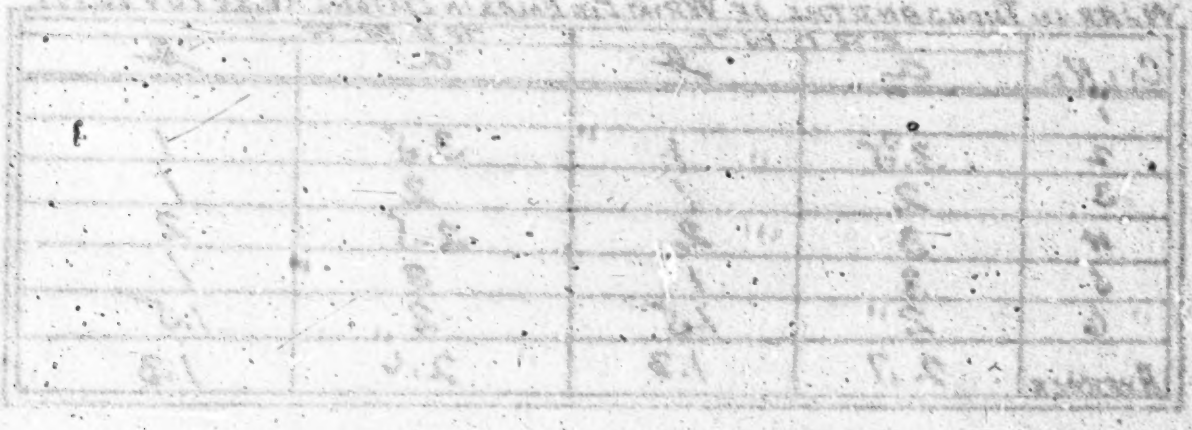
II

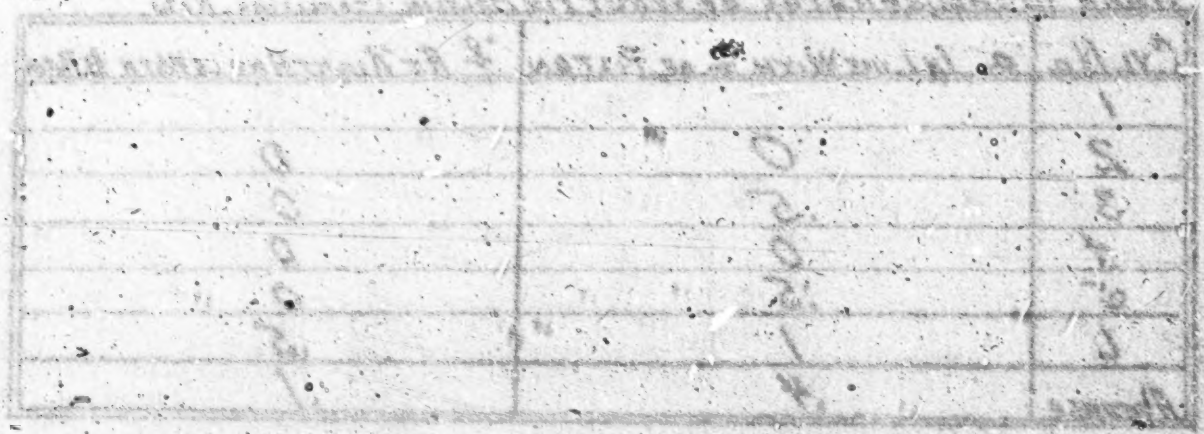
CYL. NO.	[illegible]	[illegible]	[illegible]	[illegible]
1				
2	3.5	1	3.5	1
3	2	1	2	1
4	3	2	2.5	2
5	3	1	2	1
6	2	1.5	2	1.5
AVERAGE	2.7	1.3	2.6	1.3

WEIGHT IN THROUGHOUTS AS WEIGHT TO BE MADE IN CRANKPIN BORE

III

CYL. NO.	[illegible] IN LINE WITH [illegible] OF BEARING	[illegible] TO [illegible] AT RIGHT ANGLES WITH [illegible]
1		
2	0	0
3	.5	0
4	0	0
5	.5	0
6	1	.5
AVERAGE	.4	.1





PLAINTIFFS' EXHIBIT NO. 44.

Letter to E. C. Long from Franklin Manufacturing Company, dated May 9, 1918.

(Filed January 27, 1934.)

H. H. FRANKLIN MANUFACTURING COMPANY
Syracuse, N. Y. U. S. A.

May 9, 1918

Franklin
Motor Cars

Mr. E. C. Long,
Hannibal, Mo.

Dear Sir,

Mr. Franklin has referred your letter of May 6 and preceding one to the writer.

We shall be glad to have you send us one of the sample pistons which you speak of. If more are needed we can arrange with you to supply them or we could have some made up here.

We shall await with considerable interest the arrival of this sample.

Very truly yours

H. H. FRANKLIN MANUFACTURING CO.
R. MURPHY,
Chief Engineer.

RM/C

PLAINTIFFS' EXHIBIT NO. 45.

Letter to E. C. Long from Franklin Automobile Company, dated April 17, 1918.

(Filed January 27, 1934.)

FRANKLIN AUTOMOBILE COMPANY
Syracuse, N. Y. U. S. A.

Distributors of
Franklin
Motor Cars

April 17, 1918.

Mr. E. C. Long,
Hannibal, Mo.

My dear Sir:

I have your letter of April 13 and note with interest that you have a patent piston which shows up well in test. My judgment is that you should arrange to have the piston tested in some laboratory. There are numerous places where you could have the test made, or we would make it for you. Before going ahead we would want full details of the piston or better still a sample of the piston itself. If the piston is all that you think you could put it on the market or you could license its use by manufacturers.

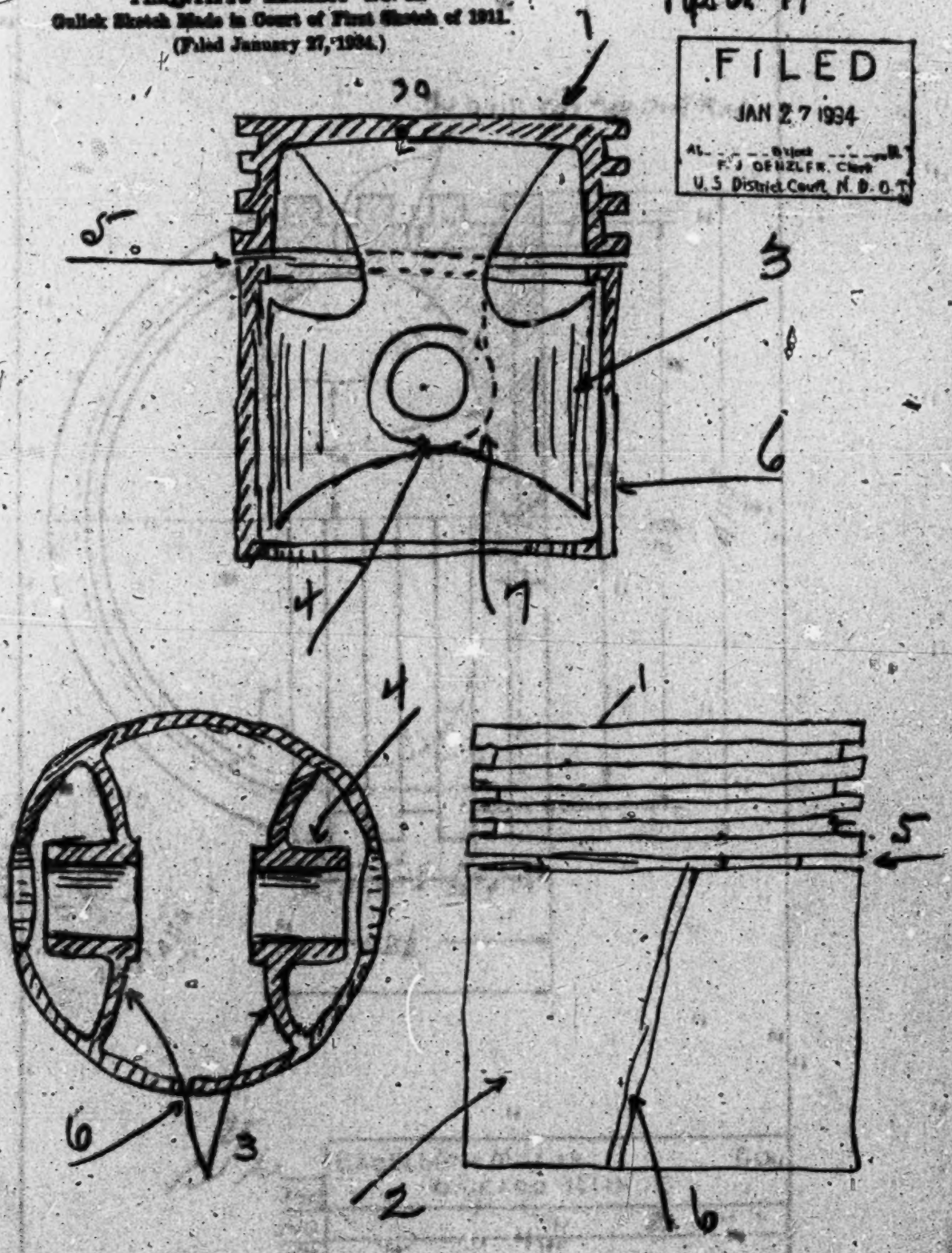
Yours very truly,

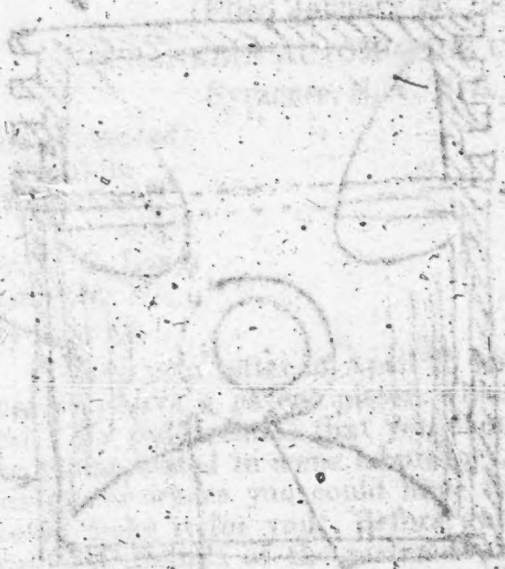
H. H. FRANKLIN,
President.

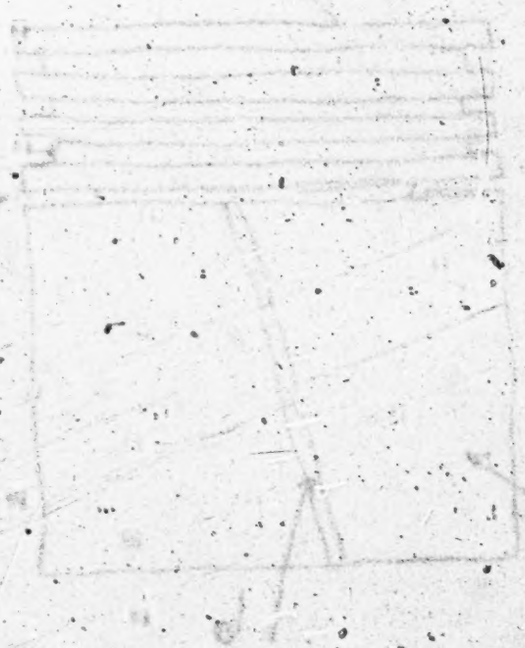
PLAINTIFFS' EXHIBIT NO. 44.
Gullek Sketch Made in Court of First Sketch of 1911.
(Filed January 27, 1934.)

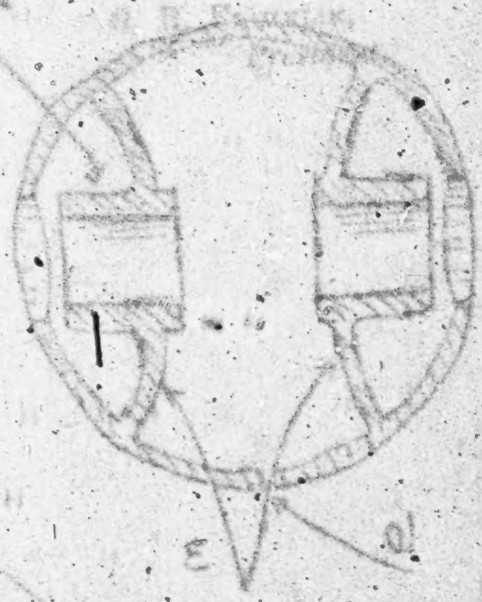
Pltfs Ex #44

FILED
JAN 27 1934
F. J. OEHLER, Clerk
U. S. District Court, N. D. O. T.

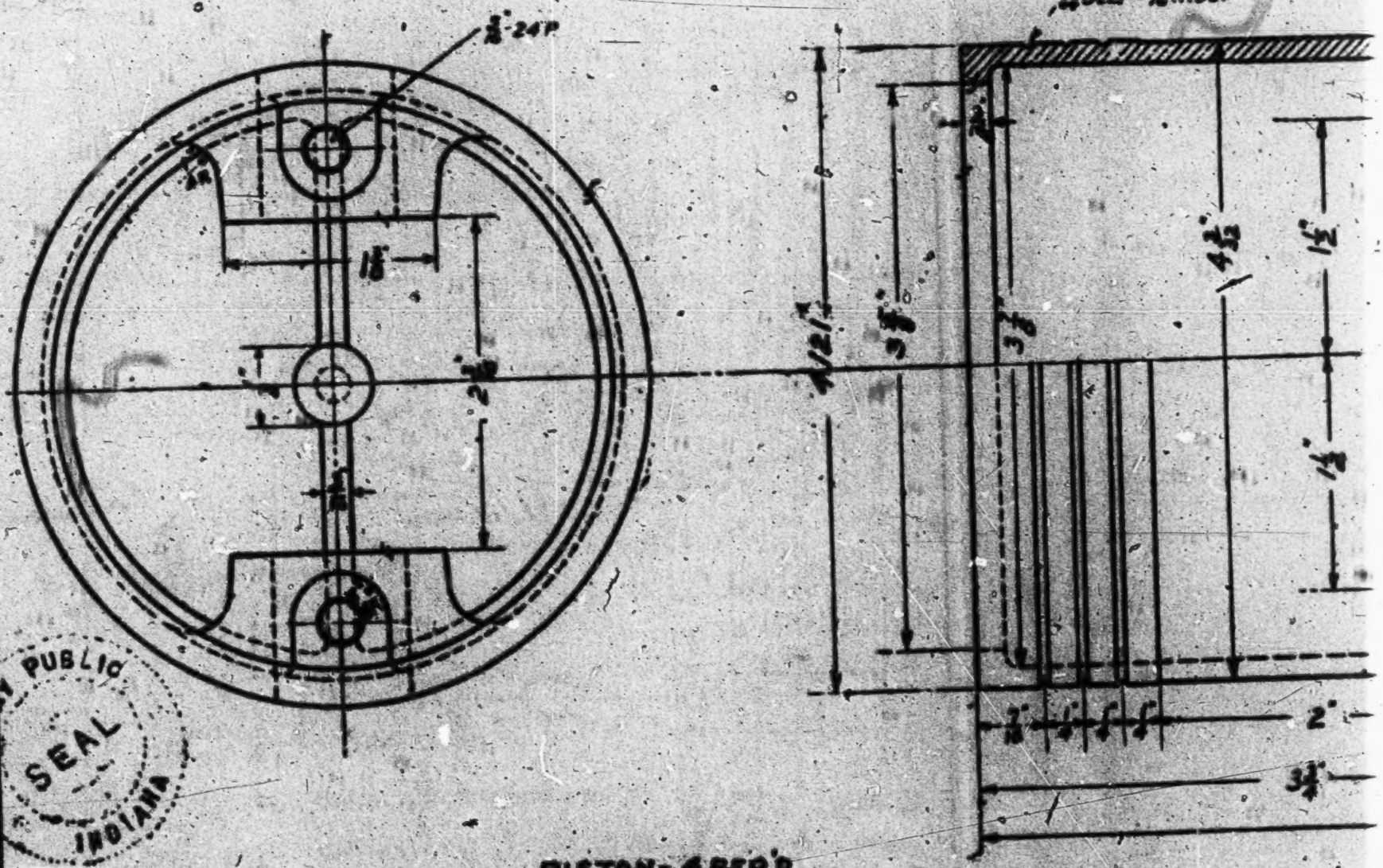








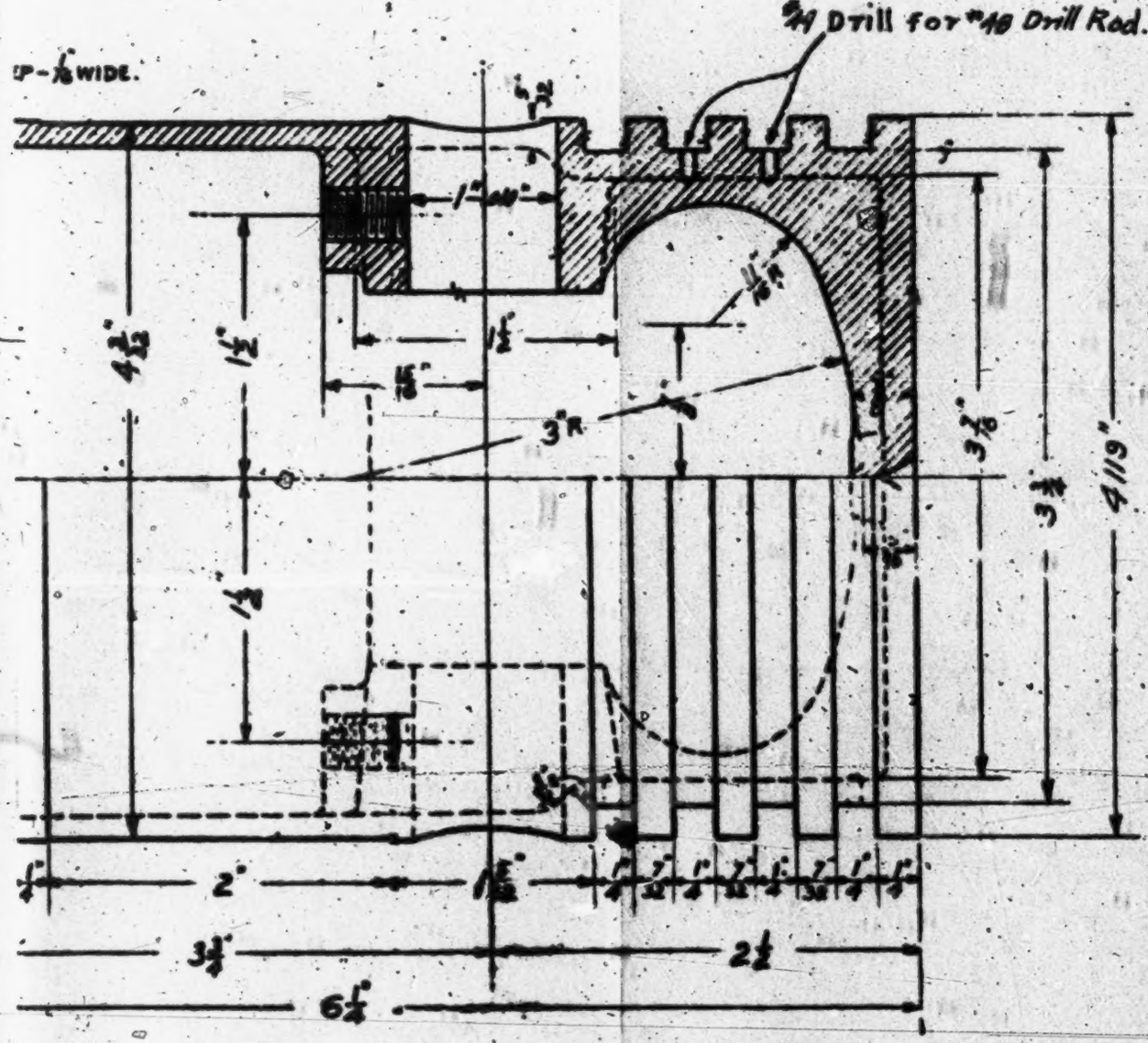
PLAINTIFFS' EXHIBIT NO. 45.
Blueprint of Standard Excelsior Motor.
(Filed January 27, 1934.)



PISTON - 4 REQ'D
CAST IRON.

Gillick Exhibit #4
Frank Balas
Notary Public

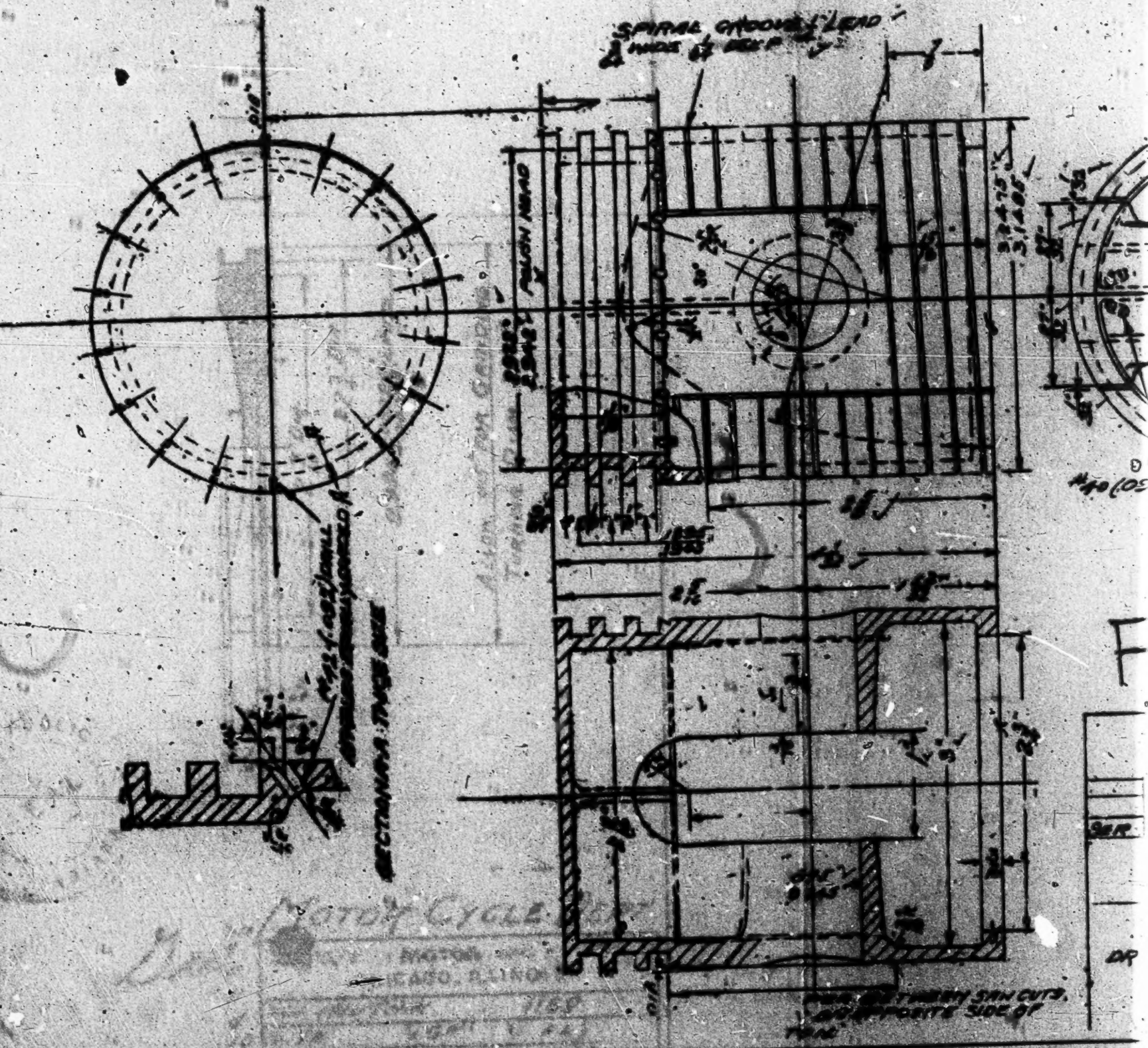
NOTARY PUBLIC SEAL INDIANA



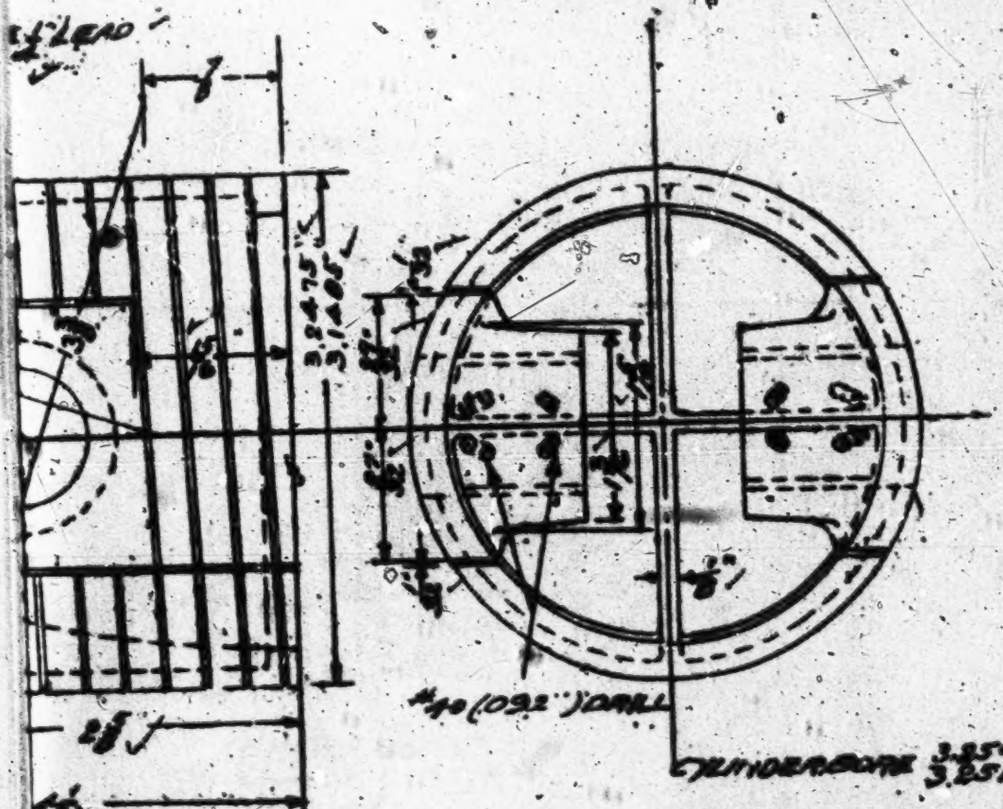
	EXCELSIOR MOTOR CO. CHICAGO ILLINOIS
3-30-10	
5-12-10	2
1-22-11	48 49
11-12-09	8-15-01

Used on all engines after first reg.

PLAINTIFFS' EXHIBIT NO. 46
Blueprint P-2612.
(Filed January 27, 1934.)



JAN 24 1919



P-2912

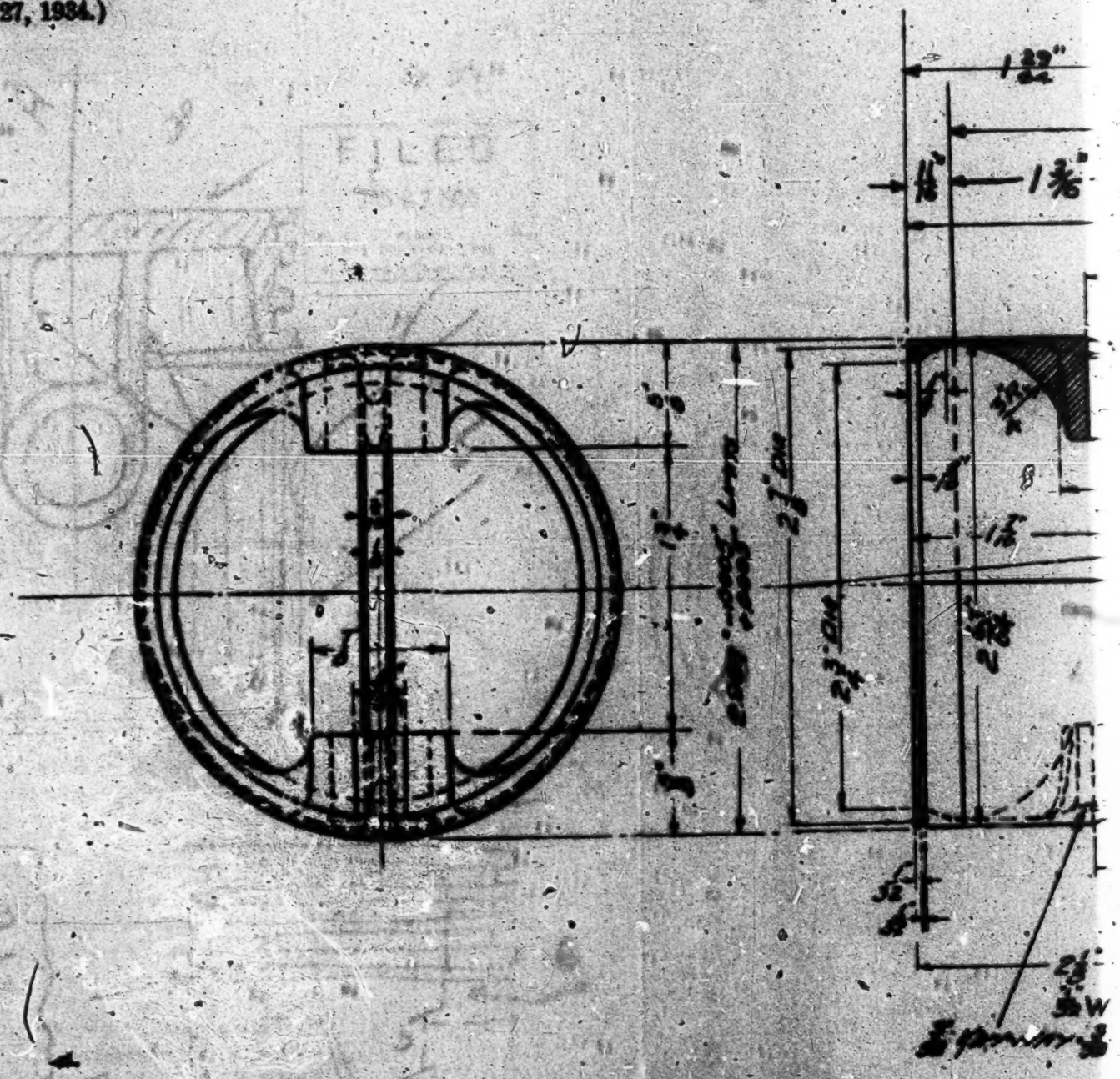
		6	AL SB
SER	MOD.	REQ	MATERIAL

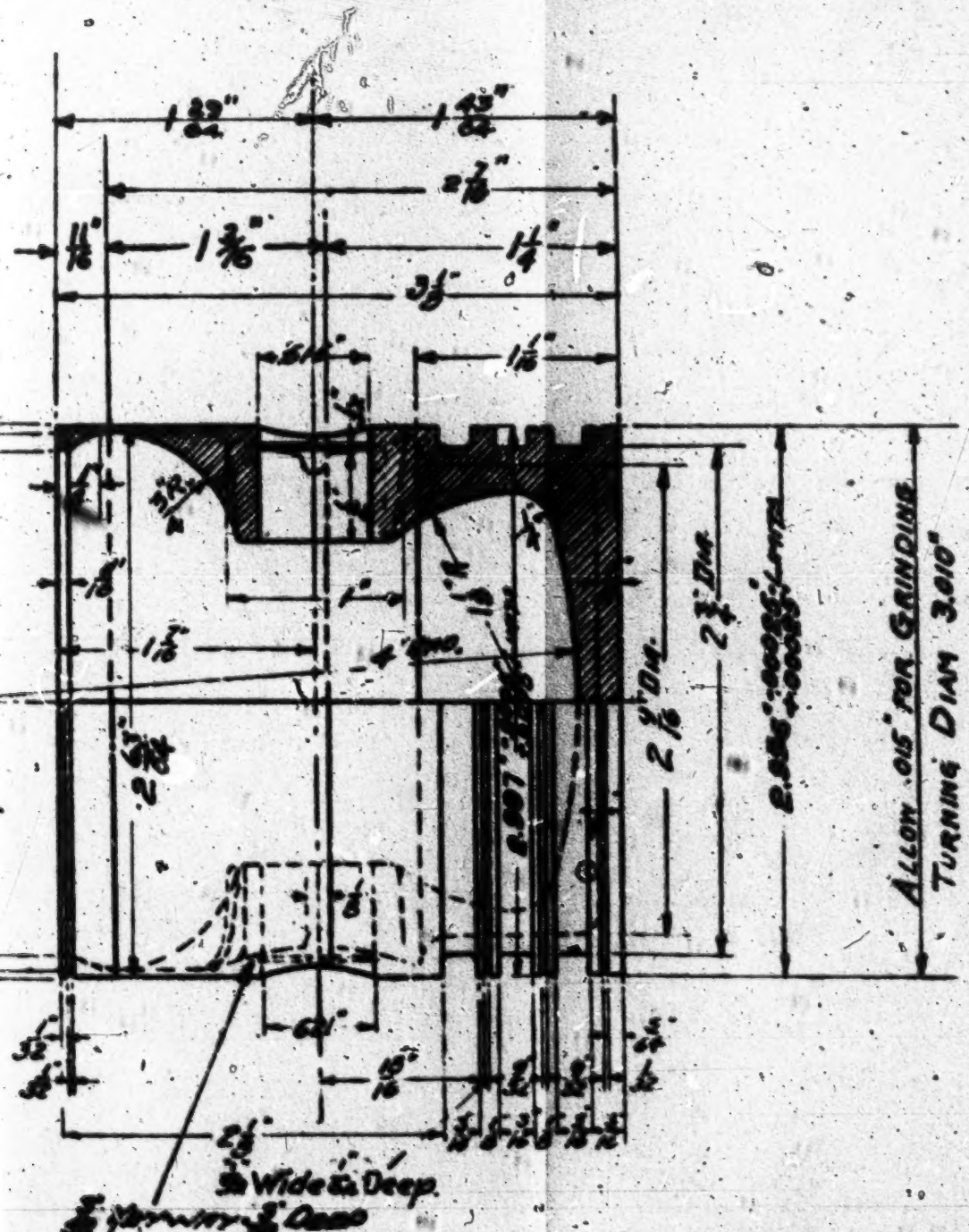
PISTON

DR CHARK July 9 '18

CK 7/7/18

PLAINTIFFS' EXHIBIT NO. 50.
Blueprint of Excelsior Motorcycle Piston.
(Filed January 27, 1934.)


1 22"
1 3/16
2 1/2"
2 1/2"
2 1/2"



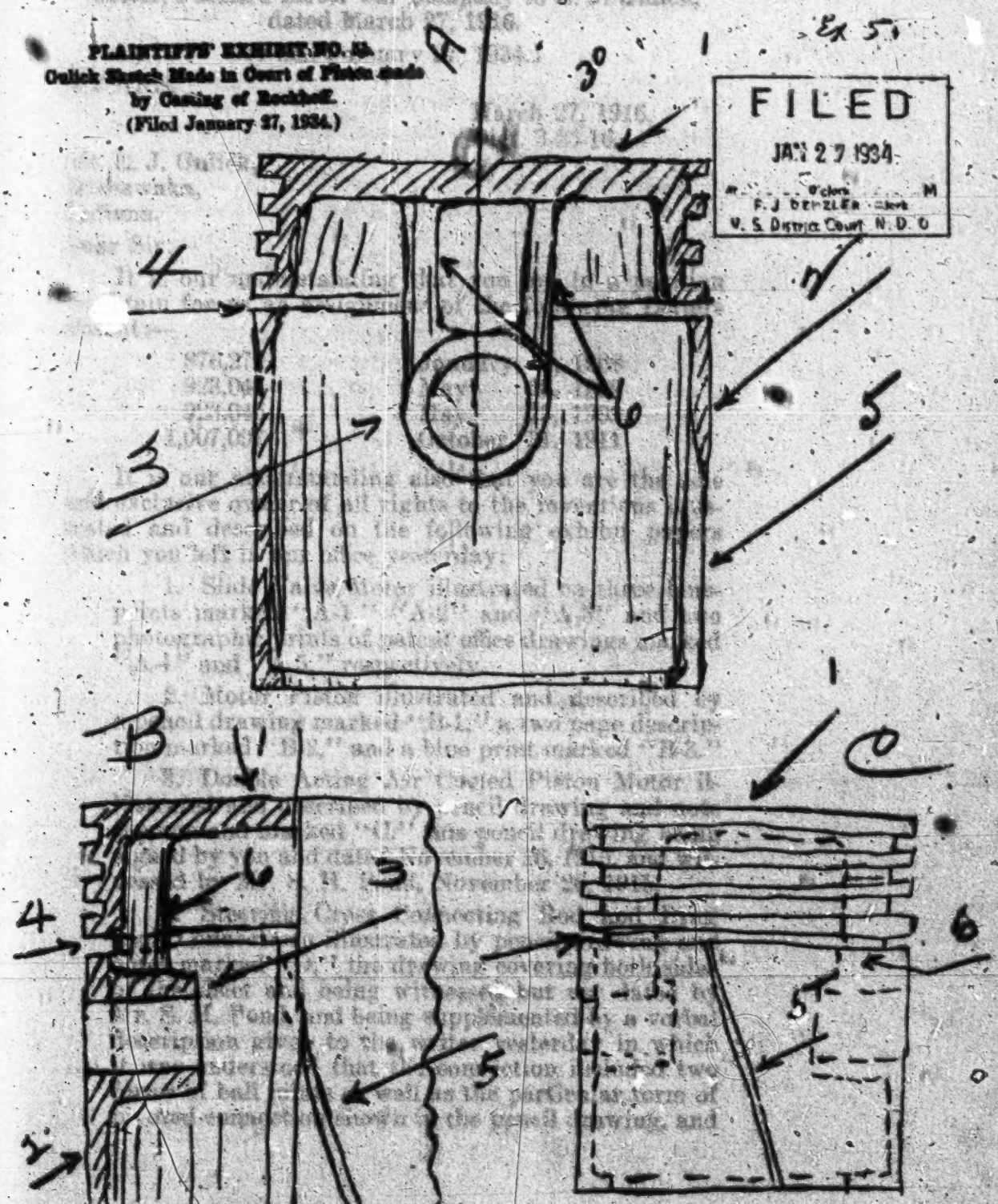
No-1169-A

MOTOR CYCLE DEPT

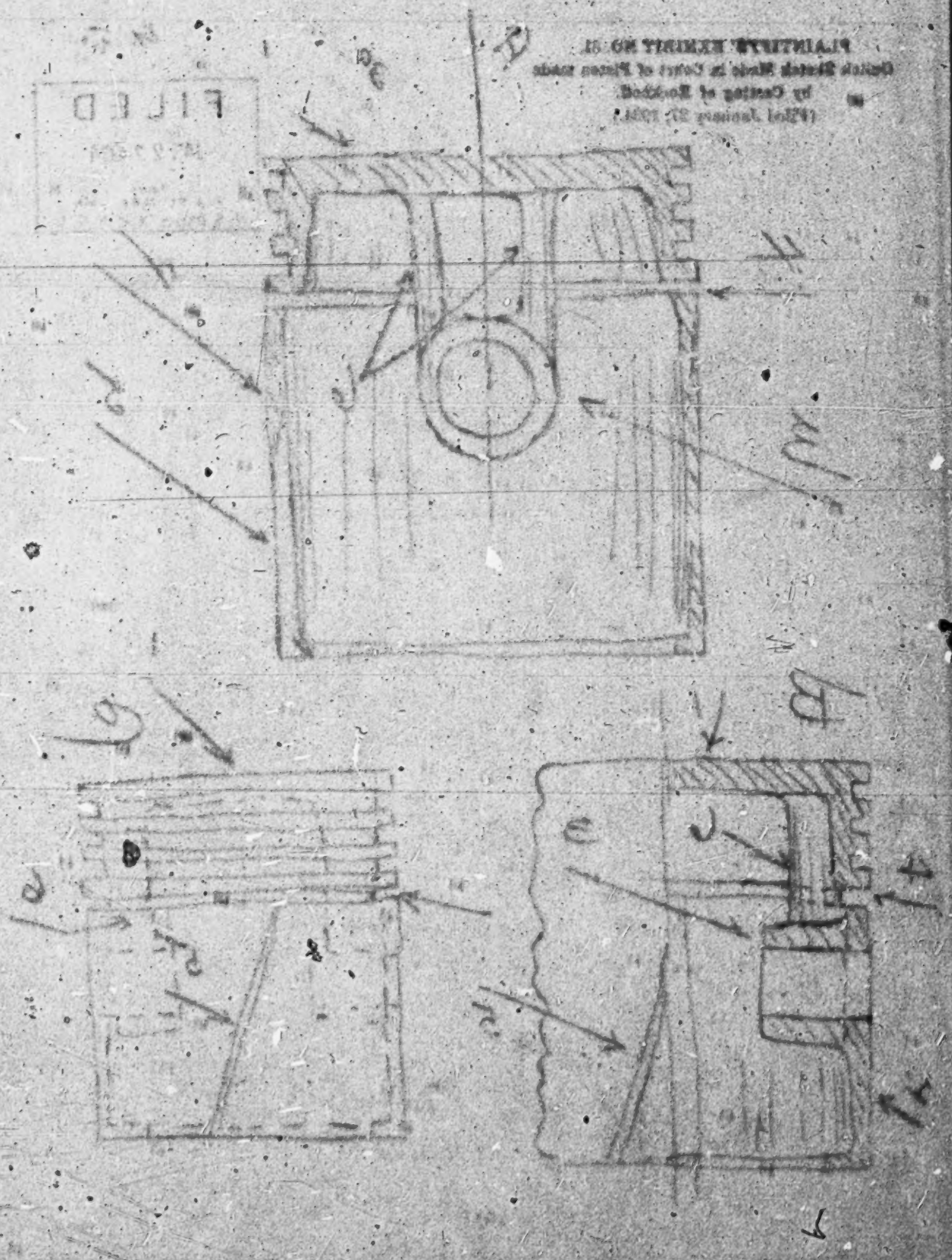
11-27-11	MOTOR
5-15-11	CHICAGO, ILLINOIS
5-10-11	
3-31-11	
3-9-11	1910 Twin 1169
6-26-10	
7-26-10	

PLAINTIFFS' EXHIBIT NO. 55.
Outlick Sketch Made in Court of Piston made by Cassing of Rockhoff.
(Filed January 27, 1934.)

FILED
JAN 27 1934
F. J. DENZLER, Clerk
U. S. District Court N. D. O.



1456



PLAINTIFFS' EXHIBIT NO. 52.

Letter, Packard Motor Car Company to E. J. Gulick, dated March 27, 1916.

(Filed January 27, 1934.)

MT'AKS.

March 27, 1916.
Dict. 3-25-16.

Mr. E. J. Gulick,
Mishawaka,
Indiana.

Dear Sir:—

It is our understanding that you are in a position to obtain for us an assignment of the following Letters Patent:—

876,272	January	7, 1908
923,044	May	25, 1909
923,045	May	25, 1909
1,007,097	October	31, 1911

It is our understanding also that you are the sole and exclusive owner of all rights to the inventions illustrated and described on the following exhibit papers which you left in our office yesterday:

1. Slide Valve Motor illustrated on three blueprints marked "A-1," "A-2" and "A-3" and two photographic prints of patent office drawings marked "A-4" and "A-5," respectively.

2. Motor Piston illustrated and described by a pencil drawing marked "B-1," a two page description marked "B-2," and a blue print marked "B-3."

3. Double Acting Air Cooled Piston Motor illustrated and described by pencil drawing and note thereon and marked "C," this pencil drawing being signed by you and dated November 26, 1915, and witnessed by Mr. S. H. Pond, November 26, 1915.

4. Steering Cross Connecting Rod and Drag Link Connections illustrated by pencil drawing and notes marked "D," the drawing covering both sides of the sheet and being witnessed but not dated by Mr. S. H. Pond, and being supplemented by a verbal description given to the writer yesterday in which it was understood that the connection included two forms of ball joints as well as the particular form of pivoted connection shown in the pencil drawing, and

it being further understood that several other drawings of these connections have been heretofore made by you and are at your home at the present time.

It is our understanding, further that for $2900.00, to be paid by us, you will obtain the assignments for us of the above referred to four patents, and give us assignments of all rights, title and interest in the first three above mentioned inventions relating respectively, to Slide Valve Motors, Motor Pistons and Double Acting Air Cooled Piston Motors, and a license to manufacture or have manufactured for us and to use and sell on our vehicles, the fourth above referred to invention relating to Steering Cross Connecting Rod and Drag Link Connections.

It is our understanding, further, that in view of the fact that there is some slight uncertainty of your being able to obtain assignments of patents Nos. 923,044, 876,272 and 1,007,097, if any one or more of those three patents cannot be obtained for us, the consideration we are to pay shall be reduced $100.00 each for patents Nos. 876,272 and 1,007,097, and $200.00 for patent No. 923,044. In any event, however, No. 923,045 is to be obtained for us. In other words, if you obtain an assignment of No. 923,045 only, the amount to be paid is $2500.00, if No. 923,044 is included also, the amount is $2700.00, if those two and No. 876,272 are obtained, the amount is $2800.00, and if all four are obtained the amount is $2900.00.

It is of course further understood that you will sign all application and other papers that may be necessary for the proper filing and prosecution of patents on the invention referred to.

We hereby accept that above referred to offer and it is our understanding that the papers will be signed up at an early date and the consideration paid to you only upon delivery of the assignments and license to us. Will you kindly acknowledge in writing receipt of this letter and the acceptance of the agreement?

Very truly yours,

PACKARD MOTOR CAR COMPANY.

.....

Patent Counsel.

PLAINTIFFS' EXHIBIT NO. 53.

Letter, E. J. Gulick to Packard Motor Car Company, dated April 1, 1916.

(Filed January 27, 1934.)

(Received Apr 3 1916 By Milton Tibbetts)

HOTEL MISHAWAKA
Bert De Vault, Manager.

Mishawka, Ind., April 1, 1916.

Packard Motor Car Co.,
Detroit, Mich.

Milton Tibbetts, Counsel.

I have your letter and proposal of the 27th relating to certain Patents and designs. I am now trying to close the deal on that basis, but as explained to you during our recent conference, I am rather uncertain of securing those held by Amplex Co. I am of the opinion at this writing that I shall be able to get them, but it may take two or three weeks to do so. The deal will be closed or off in a very few days for their plant and that will settle the matter one way or the other. Do you wish me to in event of sudden opportunity to close to advise you or Rector?

Yours truly,

E. J. GULICK.

PLAINTIFFS' EXHIBIT NO. 54.

Letter, E. J. Gulick to Packard Motor Car Company, dated December 4, 1916.

(Filed January 27, 1934.)

(Received Dec 5 1916 By Milton Tibbetts)

Elkhart, Ind., Dec. 4, 1916.

The Packard Motor Car Co.,
Detroit, Mich.

Gentlemen:—

Attention Milton Tibbetts—Patent Counsel.

Referring to the situation on Patents under date of March 27, 1916 covering your proposition for the following patent numbers—

876,272	Jan. 7, 1908
923,044	May 25, 1909
923,045	" "
1,007,097	Oct. 31, 1911

I am now in position to deliver these Patents and also include the following numbers—874,676, 923,043, 923,046, 971,038 and 1,031,785. I did not advise you relative to the situation as I was unable until recently to clear up matters owing to the sale and transfer of the Amplex plant. I am now, however, in a position to carry out the agreement and wish to know if you would not be interested also in taking over the balance of these Patents as if I dispose of any of them I would much prefer to dispose of them all. I think without a doubt that I could make the price of the remaining Patents such as would be worth your while to take them over also. Please advise me immediately and I will proceed to close up the subject.

Yours very truly,

E. J. Gulick.

Box 553, Elkhart Ind.

PLAINTIFFS' EXHIBIT NO. 55.

Letter, Packard Motor Car Company to E. J. Gulick, dated February 28, 1917.

(Filed January 27, 1934.)

February 28th, 1917.

Mr. E. J. Gulick,
Box No. 553,
Elkhart, Ind.

Dear Sir:— *Re C-797*

From our telephone conversation I understand that you will be in Chicago Friday of this week and that you will call me up at the office of Rector, Hibben, Davis & Macauley, Harrison 821, and make an appointment for sometime that day. If possible I want to take the three o'clock train back to Detroit but that of course is not imperative.

Please bring with you all papers that you may have relating to the four several inventions which were included in the original proposition, viz: (1) Slide valve motor; (2) Motor piston; (3) Double acting air cooled piston motor, and (4) Steering cross connecting rod and drag link connections.

If you will have all of the papers there I will endeavor to give you some definite answer in connection with this matter.

Very truly yours,

.....

Patent Counsel,
Packard Motor Car Company.

MT'EAP.
13909

PLAINTIFFS' EXHIBIT NO. 56.

Letter, E. J. Gulick to Packard Motor Car Company, dated May 18, 1917.

(Filed January 27, 1934.)

(Received May 19 1917 By Milton Tibbetts)

Elkhart, Ind.
May 18, 1917.

Mr. Milton S. Tibbetts, Counsel,
c/o Packard Motor Car Co.,
Detroit, Mich.

My dear Mr. Tibbetts:—

It has been several weeks since I turned the several patents over to Mr. Rector's office and have heard nothing definite on the subject up to the present writing. I realize of course that Mr. Rector is a very busy man but thought best to call your attention to the subject. I would very much like to get this matter settled up with as little delay as possible as in accepting your proposition it necessitated my tying up considerable money. I believe the assignments were all straight and the fact that I did not make an assignment to your company was that I anticipated that either yourself or Mr. Rector would desire to draw up such an assignment paper as would meet your requirements covering the several patents as well as the inventions not applied for. I trust you will give this subject your early attention and advise Mr. Pond accordingly, that the subject may be properly adjusted and closed up.

Yours very truly,

E. J. GULICK.

PLAINTIFFS' EXHIBIT NO. 57.

Letter, E. J. Gulick to Packard Motor Car Company, dated March 26, 1917.

(Filed January 27, 1934.)

(Received Mar 31 1917 By Milton Tibbetts)

Elkhart, Ind., Mar. 26-17.

Packard Motor Car Co.,
Detroit, Mich.

Mr. Tibbetts, Counsel.

My Dear Mr. Tibbetts:

I have yours of the 23d and in reply state that the delay was caused only in getting together the records of receiverships and transfers of various patents so that I can give you a clear title to same without question. The matters I now have complete and Mr. Pond has ordered copies from Washington that all may be clear and correct. I received word from him Saturday that he had not received a reply yet but expected to first of the week I can assure you I am not holding up matter any at this end. I am so very busy that I have turned over all to Pond and for'd the papers to him as I understood you to say that Mr. Rector would look after your interest from that end and with Pond relative to the details of assignments. I am

Very truly yours,

E. J. GULICK.

FILED
JAN 2 7 1934
E. H. BENZIGER, Clerk
U. S. District Court, D. D. C.

1466

FILED
JAN 27 1934
U. S. District Court D. S. C.

307

PLAINTIFF'S EXHIBIT NO. 9
Received in Evidence by Order of Court
January 27, 1934
(Filed January 27, 1934)

PLAINTIFF'S EXHIBIT No. 33

Gulick Exhibit No. 33 in Interference
No. 48,670 and 48,671
(Filed January 27, 1934)

4.33
2.62

PLAINTIFF'S EXHIBIT NO. 33

Letter, Ray Stewart Co. to E. J. Gulick,
August 24, 1923.

(Filed January 27, 1934.)

30

Marked-pl 1467
offered
afterwards admitted

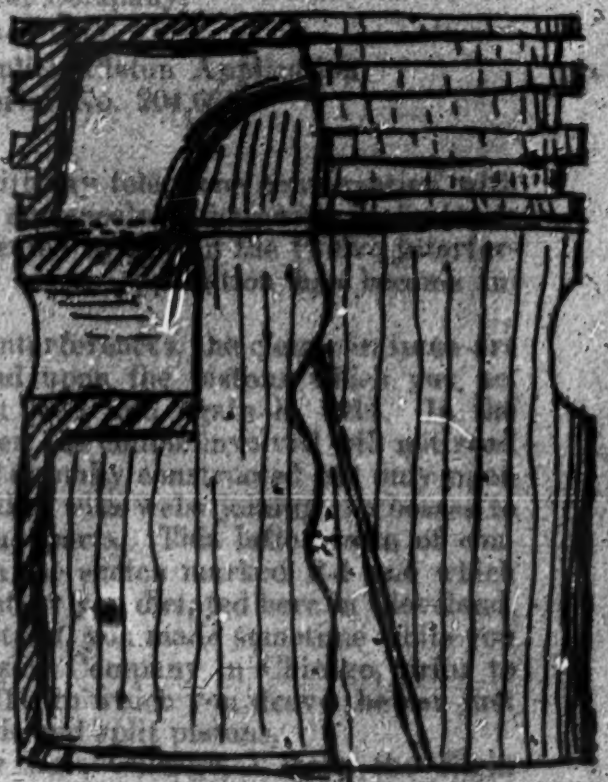


Fig. 1

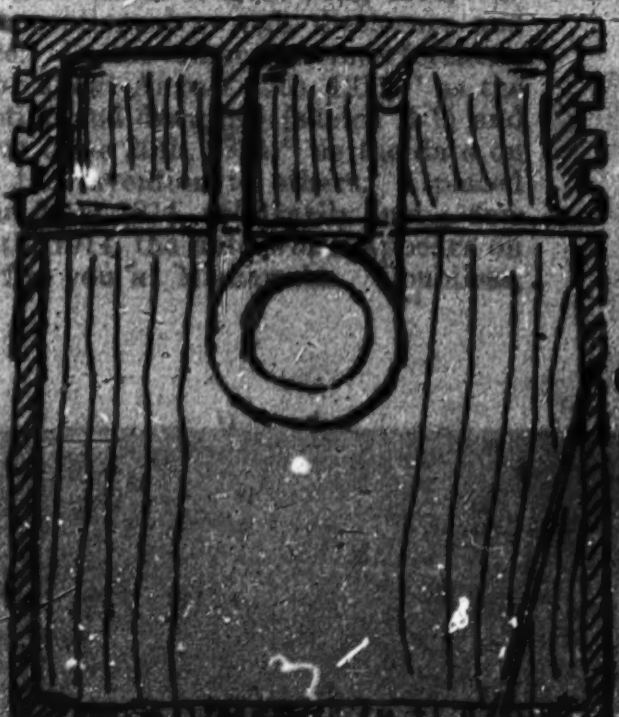


Fig. 2

Gulick Exhibit #33
Interference No. 48,670
Interference No. 48,671

PLAINTIFFS' EXHIBIT NO. 63.

Letter, Ray Stewart Gehr to E. J. Gulick, August 22, 1923.

(Filed January 27, 1934.)

August 22nd, 1923.

Mr. Edward J. Gulick,
c/o Conn Instrument Company,
Elkhart, Indiana.

In Re: Gulick Piston Application
Serial No. 204,661.

Dear Mr. Gulick:

In accordance with my telephone conversation with you this forenoon, I am encolsing herewith preliminary statements to be executed by you in the twelve interferences in which your above application has become involved.

In two of these interferences, the claims in issue are broad enough to read upon the pistons which you actually constructed in 1911 and again in 1914. In the other ten interferences, the claims involved will not read upon the pistons you actually constructed but only upon the form of construction with webs joining the bosses to the skirt and the head parts. This latter form of construction is shown in the sketch marked B-1 and which we attached to the history you dictated here in Cleveland. This sketch, I understand, you made sometime while you were with the Excelsior Company in Chicago, prior to the Elgin races of 1911, to which you drove the car just then fitted with the slit and split pistons.

From the Motor Age, Chicago, I learn the Elgin races that year were held August 25th and 26th. This seems to be the only date which we can fix definitely for the sketch B-1 and the pistons which you fitted in 1911.

Accordingly, in the two interferences above referred to, I have named "on or about August 25th, 1911," as the date for your conception, drawings, disclosure and reduction to practice. In the other ten interferences, I have named "On or about August 25th, 1911," as the date for your conception and drawings (sketch B-1) and I named "on or about June 20th, 1914," as the date on which you disclosed the invention to others. I placed this latter date, June 20th, 1914, arbitrarily just a few days before June 24th, 1914, the date which appears on the drawings made for you at Mishawaka. Doubtless,

you disclosed this subject matter to the draftsman a few days before he completed and dated the drawing.

As far as I know, you never constructed pistons as shown in the Mishawaka drawing or the drawings of your application and I accordingly stated in the statements of the ten interferences that the invention has not been reduced to practice by you other than by the filing of your application, such filing, of course, being a "constructive" reduction to practice.

The statements must be filed in the Patent Office on Monday, August 27th, and I am afraid that the time is too short for you to mail these statements back to Cleveland, so after you have executed them, I wish that you would mail them direct to the Commissioner of Patents at Washington. You will note that I have placed each statement in an unsealed envelope properly marked for filing in the Patent Office. After you have executed each statement, please return it to its proper envelope and seal the envelope, then enclose all of these sealed envelopes in the larger envelope which I am enclosing and which is addressed to the Commissioner of Patents, Washington, D. C., and at once mail it. You will understand, of course, that only the face copy of each statement is to be placed in its sealed envelope. Of the two carbon copies which I am sending, of each statement, one can be retained by you for your files, while the other should be filled in by you and returned to me for my records.

I think that I have fixed the dates as accurately as it is possible to do it but if you find anything seriously wrong, I suggest that you telephone me at once upon receipt of the statements. I shall be in Cleveland tomorrow, Thursday, but will be in Detroit all day Friday and you can reach me there by calling the Arctic Ice-Cream Company.

Yours very truly,

RSG-MS

P. S. I see that these statements will be too bulky to go in one envelope through the mail, so I am enclosing two stamped envelopes addressed to the Commissioner of Patents and you can divide the twelve statements between them.

PLAINTIFFS' EXHIBIT NO. 64.

Letter, E. J. Gulick to Ray Stewart Gehr, dated August 23, 1923.

(Filed January 27, 1934.)

(R. S. Gehr Aug 24 1923 Received)

C. G. CONN LTD.
ELKHART, IND.

August 23, 1923.

Ray Stewart Gehr,
Euclid Building,
Cleveland, Ohio.

Dear Mr. Gehr:

I am in receipt of your communication and instructions of August 22nd, covering interferences, Piston Application, Serial No. 204,661, and as far as I can see are as correct as could be expected under the circumstances.

I have today executed and forwarded the face copies to Commissioner of Patents, and also enclosed copies executed for your files.

By the way, do you not think that it would be a good plan for your clients to own the last Piston Patent which was issued to me? That is the one with the demountable skirt, with which I believe you are familiar. I am not asking no great amount for this as I realize this one patent by itself is of no great consequence, however, it would add a link in the chain of patents controlled by your clients. I would consider at the present time any reasonable offer. Would be pleased to hear from you on the subject.

Yours very truly,

E. J. GULICK.

EJG:MH
(Enclosure)

Box 553.

PLAINTIFFS' EXHIBIT NO. 65.

Gulick Deposition on Interferences 49,569, 49,570 and 49,571, pages 40 to 103, inclusive.

(Filed January 27, 1934.)

Patent Office Interference Exhibit Numbers				*This Transcript Exhibit Numbers*
Gulick Ex.		1	Gulick 1911 piston sketch	Ptf.
"	"	2	Gulick written description	"
"	"	3	Letter, Packard Motor Car Co to Gulick 3/27/16	"
"	"	4	Blueprint of Standard Excelsior motor	"
"	"	5	Piston used by Excelsior Motor	"
"	"	6	Pattern used by Excelsior Motor & Mfg. Co.	"
"	"	7	Core-box used by Excelsior Motor & Mfg. Co.	"
"	"	8	Reproduction of piston as used by Excelsior	"
"	"	9	Detail of piston shown in Exhibit 31	"
"	"	10	Cross-section drawing Gulick sleeve valve motor	"
"	"	11	Gulick Ex. 11 in Interferences 49,569-70-71	"
"	"	12	Letter, Gulick to Packard Motor Car Co., 4/1/16	"
"	"	13	Letter, Gulick to Packard Motor Car Co., 3/26/17	"
"	"	14	Letter, Gulick to Packard Motor Car Co., 12/4/16	"
"	"	15	Letter, Packard Motor Car Co. to Gulick, 2/28/17	"
"	"	16	Letter, Gulick to Packard Motor Car Co., 5/18/17	"
"	"	17	Excelsior motorcycle piston	"
"	"	18	Print of above	"
"	"	19	Gulick piston	"
"	"	20	Picture Renault type car driven by Gulick in 1911	"

Patent Office Interference Exhibit Numbers		*This Transcript Exhibit Numbers*
Gulick Ex. 21	Series of blueprints of Gulick motor	Ptf. 30
" " 22	" " " " " "	
" " 26	" " " " " "	
" " 25	Order of St. Joseph Superior Court, No. 1, appointing Receiver of Amplex Mfg. Company	
" " 27	Amplex Receivership Order authorizing Receiver to sell property and Order confirming sale of property of Amplex Motor Car Company.	" 82
	Amplex Receivership Journal Entry	" 83
" " 31A	Gilbert Casting Cards	Def. Ex. HH
" " 31B	" " "	" II
" " 31C	" " "	" JJ
" " 31E	" " "	" KK
" " D-793X	H. H. Franklin Manufacturing Company Drawing	Ptf. 92A
" " D-944X	H. H. Franklin Manufacturing Company Drawing	" 92B
" " D-960X	H. H. Franklin Manufacturing Company Drawing	" 92C

IN THE UNITED STATES PATENT OFFICE.

STEPHEN D. HARTOG vs. ELMER C. LONG vs. EDWARD J. GULICK.	INTERFERENCE No. 49,569.
ELMER C. LONG vs. STEPHEN D. HARTOG vs. EDWARD J. GULICK.	INTERFERENCE No. 49,570.
ELMER C. LONG vs. EDWARD J. GULICK.	INTERFERENCE No. 49,571.

TESTIMONY TAKEN AT SOUTH BEND, JULY 21, 1926.

Testimony taken in behalf of Edward J. Gulick pursuant to the annexed notices, and by agreement of counsel, in the office of Frank Batson, Notary Public in and for St. Joseph County, Indiana, Court Reporter, County Courthouse, South Bend, Indiana, beginning at 10:30 o'clock A. M., July 21, 1926.

Present: Ray S. Gehr, F. O. Richey and William C. McCoy on behalf of Edward J. Gulick. L. C. Kingsland on behalf of Stephen D. Hartog. H. C. Fletcher on behalf of Elmer C. Long.

DEPOSITION OF EDWARD J. GULICK.

EDWARD J. GULICK, appearing as a witness in his own behalf, having first been duly sworn, testifies as follows in response to interrogatories of counsel: [40]*

* Figures in brackets indicate the ends of the pages of the Patent Office Deposition.

DIRECT EXAMINATION by Mr. F. O. Richey.

Q. 1. Please state your name, age, residence and occupation. A. Edward J. Gulick, 58 years old, residence, Elkhart, Indiana, 2404 South Martin Avenue, works manager and chief engineer in the C. G. Conn Limited, Elkhart, Indiana.

Q. 2. Are you the Edward J. Gulick, the applicant in the United States for letters patent, serial number 204,661, filed November 30th, 1917, and involved in the above entitled interference? A. Yes.

Q. 3. Beginning just prior to the year 1911, will you give a general outline of your employment up until the present day, stating the periods of employment, the dates when you changed employment, the character of each employment, the name of the concern and the character of its product? A. Prior to 1911 and up until September, 1910, I was connected with the Amplex Motor Car Company as secretary and general manager. After September, 1910, until the 1st of January, 1911, I was connected with the Excelsior Motor and Manufacturing Company of Chicago, Illinois, as works manager. From January 1st, 1911, until November 1st, 1911, I was connected with the Excelsior Company in the same capacity. After November, 1911, and until the early part of 1914, I was not connected with any company, but was engaged in a general way in the project organizing a new Motor Manufacturing Company. This, however, was not completed until about the 1st of June, 1914, at which time a Mr. Pulsifer and myself took over from the receiver, M. W. Mix, the Amplex Motor Car Company of Mishawaka, Indiana. A company was organized known as the Amplex Manufacturing Company, and was operated until about the 1st of November, 1914, when it went into the hands of a receiver, Kamm. From then on until about the 1st of March, 1915, I was engaged in an attempt to recover the property from the receiver. As I did not succeed, I then became connected as works manager and chief engineer of C. G. Conn, Limited, Elkhart, Indiana, in which capacity I am at the present time.

Q. 4. The Amplex Motor Car Company was located where? A. Mishawaka, Indiana.

Q. 5. What did they make? A. Automobiles. [41]

Q. 6. What did the Excelsior Motor and Manufacturing Company make? A. Automobile motors, motorcycles and motorcycle motors and bicycles.

By Mr. Richey: I produce a sketch and ask that it be marked for identification, Gulick Exhibit No. 1.

Q. 7. Referring to this sketch, Exhibit No. 1, will you state who made it, if you know? A. I made it.

Q. 8. How do you identify it as your work? A. Well, I don't think anybody would make one just like it, and, being, my own work, I can't help but identify it. I can identify my handwriting. The upper writing above the section marked "A" is my handwriting; also, "C" and "D"; and the writing below "B" and the signature.

Q. 9. How about the reference numbers and lines? A. The reference numbers and lines are also in my handwriting. All of the marks on the sheet exhibited, with the exception of that marked "Gulick Exhibit No. 1" and that marked "B-1" in blue pencil, are my writing.

Q. 10. Where and when did you make this drawing? A. This drawing was made shortly after the 1st of January, in 1911, at my residence, 6658 Lowe Avenue, Chicago.

Q. 11. How do you fix the date which you have given for the making of this sketch? A. Shortly after or about January 1st, 1911, Excelsior Motor Company decided to go into the motorcycle racing game. A motordrome for motorcycle racing was expected to be opened in the early spring, and the Excelsior Company was experimenting with racing motors. Considerable trouble was experienced with the ordinary type of piston, and to eliminate those troubles, I sketched up the piston as shown as Gulick Exhibit No. 1.

Q. 12. What kind of a piston is shown in this Exhibit 1—a motorcycle or automobile? A. This is intended for a motorcycle, but could be used as well for an automobile motor.

Q. 13. To whom, if anybody, did you disclose or show this drawing, Exhibit 1? A. It was shown to my wife and, I think, to one or two other parties, friends of ours, at the time. [42]

Q. 14. Do you remember the circumstances under which you showed this to your wife? A. I do.

Q. 15. Will you recite them briefly?

By Mr. Kingsland: The question is objected to as incompetent, calling for a disclosure to a witness not qualified to testify.

A. I disclosed this to my wife and explained it to her, and further advised her that I believed it was a

good idea, as I wished her to be thoroughly familiar with it in case that anything should happen to me, she might be able to derive some benefits from it.

Q. 16. When was this disclosure made? A. In the early part, shortly after the 1st of the year, 1911.

Q. 17. Is your wife living now? A. She is not.

Q. 18. When did she die? A. In April, 1914.

By Mr. Kingsland: The testimony of this witness of making of drawings or disclosures prior to August 25, 1911, is objected to as contrary to the preliminary statements.

By Mr. Fletcher: The same objection.

By Mr. Richey: Notice is given that motion will be made to amend the preliminary statements of Mr. Gulick so that they shall conform to the date given in the testimony, at a seasonable time. Although a careful and diligent search was made before the preparation and filing of the preliminary statements, more recent investigations have developed further information.

Q. 19. When was the motordrome for motorcycle racing referred to in your answer to Q. 11 opened in Chicago? A. It was opened for preliminary work several weeks prior to the official opening in July of 1911. The reason for this was that the track was complete, but the seating capacity had not been completed up until the official opening.

Q. 20. Have you any other way of fixing the date of the making of Exhibit 1 than you have named? A. None other except that we made a set of these pistons for a motorcycle motor which was block tested to be used in a racing motor prior to the official opening. Further the pistons used in this test were of the [43] standard racing type and were split to develop the split skirt idea, but were not ribbed exactly as shown in this sketch.

Q. 21. By official opening, you mean the official opening of the motordrome, do you not? A. I mean the official opening of the motordrome to the public in July, 1911.

Q. 22. Was this before or after the receivership of the Excelsior Company? A. After the receivership.

Q. 23. Will you give a brief description of the block test of these motorcycles tested, and say how they operated, and what they did? A. These pistons were put in a specially constructed two-cylinder, air-cooled motor-

cycle motor, and they were put on the test block and ran for several hours, and the pistons used in these motors for racing purposes were of a very light semi-steel construction, and as the standard piston for this purpose was not ribbed according to the sketch, but the skirt was split, weakened them, and they were not put in the races. As to just the nature of the breaking up of them, I cannot say. The speed of this motor was something over four thousand R. P. M. Had they been constructed particularly for the work as per sketch, the troubles experienced would not have occurred. They, however, demonstrated in this test their ability to run and adapt themselves without seizing or scoring, which was one of the troubles with the standard type piston.

Q. 24. Did you do any experimental work on racing motorcycles at any other time than during the first part of 1911? A. No other work in connection with this piston on a motorcycle.

By Mr. Richey: I offer in evidence as Gulick's Exhibit No. 1 the drawing marked for identification Gulick Exhibit No. 1.

By Mr. Kingsland: The offer in evidence of Exhibit No. 1 is objected to on the ground that it is not warranted by the preliminary statement; on the further ground that it has not been sufficiently proven, and upon the further ground that it has not been connected with the issues of the interference, and is therefore incompetent and immaterial.

By Mr. Fletcher: Same objection. [44]

By Mr. Richey: The notary is requested to mark for identification the two pages of written matter which are now produced, Gulick's Exhibit No. 2.

Q. 25. Who wrote up the description of Exhibit No. 2? A. I did.

Q. 26. How do you identify it as your work? A. It is my handwriting.

Q. 27. Where and when was this Exhibit No. 2 written up by you? A. In the early part of 1911, shortly after the first of the year, and at the same time that Exhibit No. 1 was made.

Q. 28. And at the same place? A. Same place.

Q. 29. Were the two of them ever attached together? A. They were.

Q. 30. What construction is described in Exhibit 2? A. A construction as shown in No. 1.

Q. 31. I will ask you to read the descriptive matter of Exhibit No. 2 in the record.

A. "Relating to an Engine Piston which provides for and prevents seizing, binding or scoring when hot or oversize. It is a well known fact that all engine pistons are necessarily made smaller than the cylinder in which they operate to provide for lubrication and prevent seizing or cutting due to the expansion of the piston in the cylinder when hot.

1. The piston consists of a head 1 having a groove 6 for carrying packing rings and a body 2, which provides bearing surface and which is split as indicated by 7 to provide for expansion.

2. The Head 1 and Body 2 are held together by the ribs 3 and 4. Ribs 3 and 4 carry bosses 5 for receiving the piston pin. Ribs 3 and 4 are not limited to shape or position, and the number of ribs and location and shape may be altered as desired.

The head 1 is machined small enough to allow for expansion and not bind or seize, while the body 2 is machined as close to size as is possible to make a fit and any expansion is taken up by the slot 7 and which prevents any seizing or binding between the piston and cylinder walls in which the piston [45] moves. By this construction it is possible to make a fit that prevents any pounding which is prevalent with the common type of piston."

Q. 32. By whom or to whom was Exhibit 2 read? A. It was read to my wife.

Q. 33. State when and under what circumstances? A. It was read to her in the early part of 1911, in the evening at the time of which the sketch was made and at the time at which these specifications were drawn up.

Q. 34. You brought a patent suit against the Packard Motor Car Company, didn't you? A. I did.

Q. 35. When was this, to the best of your recollection? A. About the middle of the year of 1913.

Q. 36. In what court was this suit brought? A. Chicago, Cook County.

Q. 37. It was in the Federal Court, wasn't it? A. I believe it was.

Q. 38. Was that the only suit you brought against the Packard Company on a patent? A. It was.

Q. 39. Now, did the events which you have recited regarding Exhibits 1 and 2 occur before or after the bringing of this suit? A. Before.

Q. 40. Where have Exhibits 1 and 2 been since they were made by you in the first part of 1911? A. They were in my possession until turned over to Offield, attorney, of Chicago, and later to S. W. Pond, of Pond and Wilson; later they came into my possession and were turned over to the Packard Motor Car Company; since turning them over to them, do not know just where they have been.

Q. 41. When were they turned over to the Packard Company? A. It was about a year after my settlement of a suit with the Packard Company in 1915, which I think was in 1916.

Q. 42. To whom did you deliver them for the Packard Company? A. To Milton S. Tibbetts.

Q. 43. He was and is still the patent attorney for the Packard Company? A. He is.

Q. 44. Did you deliver them to him in Detroit? A. I did.

Q. 45. Did he write you a letter about them later? A. He did. [46]

Q. 46. Can you produce that letter? A. I cannot.

Q. 37A. Have you searched for it? A. I have.

Q. 38A. Do you know where it is? A. I do not.

By Mr. Richey: I offer in evidence, as Gulick's Exhibit No. 2 the descriptive matter so marked for identification.

By Mr. Kingsland: The offer in evidence of Exhibit No. 2 is objected to on the ground that it is not warranted by the preliminary statements and upon the further ground that it is not evidence of the invention covered by the counts in the interferences.

By Mr. Fletcher: Same objection.

By Mr. Richey: I produce a copy of a letter from Packard Motor Car Company to E. J. Gulick, March 27, 1916, and ask that it be marked for identification, Gulick Exhibit 3.

Q. 39A. Will you look at Exhibit 3 and if this refreshes your recollection as to the date when you left Exhibits 1 and 2 with Mr. Tibbetts, will you state that date as near as you can?

By Mr. Kingsland: The question is objected to as incompetent as requiring a double inference, the letter of which a copy has been produced is the best evidence and no proper basis has been laid for the reference to a copy.

A. I was in Detroit the day prior to the writing of this letter, Exhibit 3, which would be either March 24th or 25th, 1916, as according to this Exhibit 3, Mr. Tibbetts dictated this letter on the 25th.

Q. 40A. Now can you state the date when you left Exhibits 1 and 2 with Mr. Tibbetts? A. Exhibits 1 and 2 were left on the same date, while in Detroit.

Q. 41A. That is, on the 24th or—25th of March, 1916? A. Yes.

Q. 42A. Did you show this Exhibit 2 to anyone except your wife, prior to the time you showed it to Mr. Offield? A. Not that I recall.

Q. 43A. About what were the dates that you showed Exhibits 1 and 2 to Mr. Offield and to Mr. Pond? A. [47] Exhibits 1 and 2 were turned over to Mr. Offield, as near as I can recall, in 1913.

Q. 44A. The descriptive matter in Exhibit 2 refers to the construction shown in Exhibit 1, does it not? A. It does.

Recess until 2:00 o'clock P. M.

Q. 45A. Were Mr. Offield and Mr. Pond experienced in motors so that they were capable of understanding the disclosure of Exhibits 1 and 2?

By Mr. Kingsland: The question is objected to as calling for a conclusion or opinion of the witness.

A. As attorneys experienced in handling such matters, yes.

Q. 46A. Both of these men were patent lawyers who had been in practice, to your knowledge, for years before you made the disclosures to them, were they not? A. They were.

Q. 47. Now you have said that you fixed the dates when you made Exhibits 1 and 2 and the dates of the associate events you have related as prior to the opening of the Chicago motordrome, as prior to your suit against Packard, and as prior to your wife's death, are there any other events by which you can fix the dates when you made Exhibits 1 and 2 and the associate events, and if so will you state what they are? A. The Exhibits 1 and 2 were made prior to the Excelsior plant being turned over to Schwinn, the purchaser, in November, 1911; also the paper on which these sketches were made were an inferior grade of bond paper which was purchased by the Amplex Motor Car Company, a quantity of which I had taken to my home in Mishawaka, and

later, when I moved to Chicago, about the 1st of December, 1910, I took it with me. This paper was used principally for sketching, and some of it remained in my possession until 1914, the time which my wife died. At that time it was scrapped, as all my possessions were sold.

Q. 48. That is, you mean that such of this paper as was on hand in 1914, when you moved back to Mishawaka, was destroyed? A. Yes. [48]

Q. 49. The description of the construction shown in Exhibit 1 and which description is on Exhibit 2, says that "any expansion is taken up": will you explain how this expansion was taken up in the piston illustrated in Exhibit 1? Or how you intended it to be so taken up? A. The object of the slot 7 was to permit of the closing up of the body 2; the body being sufficiently flexible to permit of closing up slightly of slot 7. By this slot, the action would be similar to the closing of a piston t[illegible]

Q. 50. What would happen to the webs or ribs 3 and 4 during this expansion and contraction?

By Mr. Kingsland: The question is objected to as incompetent on the ground that the witness has not qualified to interpret the disclosure as shown by the Exhibits adduced, and the witness has testified to no fact justifying his supplementing the disclosures of these exhibits.

A. Ribs 3 and 4 would flex slightly in connection with body 2.

Q. 51. Of what material were pistons made in 1911? A. They were called semi-steel, a gray-iron mixture with steel introduced.

Q. 52. What material did you contemplate for the piston illustrated in Exhibit 1 and described in Exhibit 2? A. No specific material was specified. Either gray iron or aluminum could be used, depending on the design and its requirements.

Q. 53. Webs of these materials would be flexible, wouldn't they? A. They would to a degree sufficient to provide the necessary flexibility to prevent seizing or scoring.

Q. 54. The motorcycle pistons which were made in 1911 with the slits in them, as you have testified, were made of what material? A. Semi-steel. At least that is what it was supposed to be.

Q. 55. State whether or not the piston shown in Exhibit 1 could operate as described in Exhibit 2 without

some flexing of the ribs or webs 3 and 4. A. It could not, without a very slight flexing of the ribs.

By Mr. Kingsland: It is now moved that all evidence in connection with Exhibits 1 and 2 be struck out on the ground that the structure there [49] disclosed upon the admissions of this witness are inoperative.

By Mr. Fletcher: The same objection as noted by Mr. Kingsland.

Q. 56. Did the Excelsior Company have a Renault type of automobile while you were with the company, and particularly during the year 1911? A. They did.

Q. 57. Who operated this car? A. I operated one of them.

Q. 58. What kind of pistons were in the Renault type of car that you operated? A. During the period of a year they had a split skirt piston installed in the motor.

Q. 59. What kind of piston was in the car before the installation of the split skirt piston? A. A standard type piston.

By Mr. Richey: The notary is requested to mark for identification the blue print which I produce, Gulick's Exhibit No. 4, and the piston which I produce, as Gulick's Exhibit 5.

Q. 60. Will you compare the piston in the Renault type of car before the installation of the split piston with the piston illustrated in Exhibit 4 and the piston Exhibit 5? A. Exhibits 4 and 5 are the same piston, but are not of the split type, and are the same as was installed in the Renault car prior to the installing of the split piston.

Q. 61. Do you know where Exhibit 4 was made, or anything else about its history? A. It was evidently made in the drawing room of the Excelsior Motor Manufacturing Company, and as the motor was designed by L. P. Mooers, I believe that Exhibit 4 was designed by him.

Q. 62. Was it the custom with the Excelsior Company to print its name and place the dates on its tracings when you were there? A. It was.

By Mr. Richey: The print marked for identification is offered in evidence as Gulick's Exhibit No. 4.

By Mr. Kingsland: To the introduction in evidence of Exhibit No. 4 is objected to on the ground that it is immaterial and has not been connected in

any way with the matters involved in this interference. [50]

Q. 63. Do you know where Exhibit 5 came from? A. I do not, I never saw it before. But from its dimensions and appearance, I would say it was made from the blue print Exhibit 4.

Q. 64. Did you see Exhibit 4 or the tracing from which it was made or any other print made from that tracing while you were employed with the Excelsior Company? A. I cannot say that I ever saw the tracing, but I have seen numerous prints same as Exhibit No. 4 in the machine department of Excelsior Motor Manufacturing Company during the period of 1911, as this was a standard type of piston for the Excelsior motor.

Q. 65. Who molded these pistons in 1911? A. A few of them were made by a Chicago foundry. I cannot recall their names. The major portion of all of them, to the best of my recollection, were cast by a concern in the east. I believe it was the Manufacturers Foundry Company, as they cast all of the motor cylinders, I believe they also cast the pistons.

Q. 66. Were any of these pistons made by a concern in Cleveland, Ohio? A. They might have been, as the purchasing department were compelled to secure them at times at different places.

By Mr. Richey: Piston marked Gulick's Exhibit 5 is offered in evidence as Gulick's Exhibit 5.

By Mr. Kingsland: The introduction in evidence of Exhibit No. 5 is objected to as incompetent, as the witness was unable to identify it, and it is further objected to as immaterial, not having in anywise been connected with the matters in controversy.

By Mr. Fletcher: The introduction of Exhibit No. 5 in evidence is objected to on the ground that it has not been sufficiently identified, and on the further ground that the exhibit is not in any way connected with the issues involved.

By Mr. Richey: I now produce a pattern and ask that it be marked for identification Gulick's Exhibit 6; and a core box, and ask that it be marked Gulick's Exhibit 7.

Q. 67. Will you look at the pattern and core box marked Exhibits 6 and 7 and state what they are and what you know about their history? A. Exhibit 6 is a [51] pattern for piston as shown in Exhibit 4, and Exhibit 7

is the core box of same. The Excelsior Motor Company were the owners of these patterns and core boxes, the product of which was used in the manufacture of Excelsior motors during the year of 1911.

Q. 68. Can you tell if Exhibit 5 was made with Exhibits 6 and 7? A. I cannot say that Exhibit 5 was made from the pattern, Exhibit 6 and from the core box, Exhibit 7, as the Excelsior Motor Company had several of these same patterns and core boxes exactly duplicating Exhibits 6 and 7.

Q. 69. You have said that the pistons like Exhibit 5, which were in the Renault type car you operated in 1911, were taken out and slitted: can you explain how they were slitted? A. The pistons as used in the Renault cars were new pistons and were slotted across the top of the skirt just below the upper ring between the piston pin bosses on one side only, and were then diagonally slotted throughout the length of the skirt on one side, being the same side.

By Mr. Richey: I ask that the piston which I now produce be marked for identification Gulick's Exhibit 8.

Q. 70. Will you compare the piston Exhibit 8 with the slitted pistons which were placed in your Renault car in 1911? A. They were the same in the car as Exhibit 8.

Q. 71. How many of these slitted pistons were installed in this car? A. Four.

Q. 72. This was an air-cooled car? A. It was not: it was a water-cooled.

Q. 73. When were these slitted pistons like Exhibit 8 installed in your Renault car? A. They were made during the month of July, 1911, and after passing through the test department, were installed in the Renault car just prior to the Elgin road races which were near the middle of August in 1911.

Q. 74. Have you any other way of fixing the date of the making and installation of these slit pistons? A. Yes.

Q. 75. Will you recite them? A. After the block test, the first time the Renault car was driven on the road with the split pistons installed was to the Elgin [52] races; further, that these pistons were being made at the time we were experimenting with motorcycle engines for racing purposes at about the time of the Chicago motordrome; by this, I mean the official opening. Further, I would state that it was quite necessary to do a lot of

special work in installing this motor, and there was a great deal of rush to get it done in time to drive it to Elgin.

Q. 76. Did you see the slits cut in any of these pistons? A. I don't know that I saw them while they were cutting them, but I saw them before they were installed in the motor.

Q. 78. Who gave the instructions for slitting them? A. I did.

Q. 79. To whom? A. To the best of my recollection, they were given to a Mr. Johnson, who was foreman of the tool room where this work was done. It is possible, however, that some of the work may have been done in the piston production department under the instructions of Mr. Johnson to the foreman, Mr. Biers.

Q. 80. Did you see these pistons installed in the car? A. I saw them when they were installing them in the motor, prior to its going to the test block, but did not see them afterwards until the motor was torn down.

Q. 81. Who installed them in the car? A. Morris Engle installed the motor in the car.

Q. 82. Who installed the pistons in the motor? A. There were a number of employes engaged in this work, and I do not know their names.

Q. 83. Of what material were the pistons made? A. A selected quality of gray iron.

Q. 84. What was the clearance between the slitted pistons and the cylinder walls? A. The head clearance about the rings was made the same as the standard piston, which was about seven thousandths; the skirt clearance was made to fit the cylinder walls as close as it was possible to fit them in dry.

Q. 85. Can you give the skirt clearance in thousandths of an inch? A. Not more than one and one-half thousandths. Practically impossible to get much closer owing to the fact that the pistons were seldom absolutely round after the final finish grinding, which was [53] seldom perfectly true. With a perfectly true bore and a perfect piston they could be fitted somewhat closer and not seize.

Q. 86. How did this compare with the skirt clearance of the standard type unsplit piston used in this motor prior to the installation of those like Exhibit 8? A. The standard piston specifications were for four thousandths clearance of the skirt; however, there was a variation in cylinder bore and piston diameter, and the clearance usually varied from four to seven thousandths.

Q. 87. You have spoken of block tests of pistons like Exhibit 8: will you explain these block tests, stating where they were made, when they were made, and by whom they were made? A. By block tests was meant putting the motor in a test frame; the motor is then run by belt or by attaching another motor to it for a period of four hours or more. It is then put under its own power for a period of time, running under that load; later the load is increased and the final test for power, speed and so forth, either a brake is used, and which was used at that time, and at the present time most of the motors are tested for power loads by electric generator for absorbing the load. This motor was tested as above described by brake, as a number of testers were employed in that department, do not know who made the test; but was present when it was being run. This test was run in August, 1911, at the Excelsior Motor Company plant test room just prior to the Elgin races.

Q. 88. Who saw it besides you? A. Morris Engle saw the motor running on the block, the same Morris Engle as installed it in the car. Others saw it, but I do not know their names.

Q. 89. How long did it take to make the test? A. The motor went on the block late in the afternoon, was run all night, came off the following day late in the afternoon, and was installed that evening, and the next morning early completed, which was the day of the Elgin races.

Q. 90. You drove it to Elgin with the split pistons like Exhibit 8 in it, did you? A. I did.

Q. 91. Did you drive it on any other trips? A. I did.

[54]

Q. 92. How far did you drive this car with the split pistons like Exhibit 8 in it? A. I would say at least three thousand miles.

Q. 93. Over how long a period of time? A. From the day of the Elgin races in August until about the middle of October, 1911.

Q. 94. At what speeds did you drive your car with these pistons installed? A. It was driven at all speeds up to sixty miles an hour.

Q. 95. Do you remember a trip you took with Mr. Williamson? A. I do.

Q. 96. Will you state who was on this trip, what was the length of the trip and when it was made? A. This trip was made about the first of October. Mr. Williamson and his wife, myself and my wife, drove from Chicago

to Mishawaka, Indiana, and return, two days, and travelling all told around three hundred miles.

Q. 97. Will you describe how these pistons like Exhibit 8 operated in the motor of your car during its use by you and when the block test was being made? A. During the block test they operated perfectly; and during the road work, from the time they were installed in August and until about the 1st of October, they worked entirely satisfactorily. On the trip to Mishawaka, about the last of October, on the return, near Michigan City, they developed trouble, a peculiar sound in the motor indicated trouble. I called Mr. Williamson's attention to it, told him I believed something had gone wrong with one of them. This trouble, however, was evidenced only at speeds above thirty miles an hour. On my return to Chicago the car was driven for a few days in October, and then torn down. That is, the motor was removed, and an examination disclosed that one of the pistons only had cracked through from the slot below the lower ring into the piston boss. This caused a slight enlargement of the piston pin hole, which was responsible for the noise which we heard. The pistons were removed from the motor and standard type pistons installed. That was the last they were used in the Excelsior motor. This was October, 1911.

Q. 98. What was the condition of the other three Exhibit 8 pistons? A. They were in perfect [55] condition. There was no signs of cutting or scoring, and the motor never exhibited at any time any signs of piston slap or laboring.

Q. 99. The noise in the injured piston was due to the fact that the pin was loose in the enlarged hole, was it not? A. It was.

Q. 100. What, if anything, did you say to Mr. Williamson on this trip about the slits in the pistons? A. I explained to Mr. Williamson how these pistons were constructed, and as he was an automobile man of some years' experience, he was very much taken with the idea; and further, I told him, after I had removed the pistons, explaining to him the causes of the noises which we had heard on the trip.

Q. 101. Where are these pistons now? A. I do not know.

Q. 102. Do you know what became of them? A. I do not, as the Excelsior Motor Company was sold shortly after the first of November, 1911, and much of the

motor material which was considered as scrap was disposed of prior to his taking it over.

Q. 103. Who removed the pistons from the motor? A. The motor was torn down in the erecting department, and I do not know the employes' names who did the work.

Q. 104. Do you know of anyone else than those you have named who saw any of these Exhibit 8 pistons? A. There were a number of Excelsior employes who saw them, but I do not know their names.

By Mr. Richey: The piston marked for identification Exhibit 8 is offered in evidence as Gulick's Exhibit No. 8.

By Mr. Fletcher: The introduction in evidence of Exhibit No. 8 is objected to as incompetent on the ground that it has not been sufficiently identified.

By Mr. Kingsland: It is obvious that the testimony of this witness in relation to Exhibits Nos. 5 to 8 inclusive is immaterial to the counts of the interferences Nos. 49,569 and 49,570, in which the party Hartog is interested. If it is counsel's intention to urge any materiality, I now desire to make it clear that an objection is made to any testimony [56] concerning these exhibits as being applicable to the two interferences above numbered.

Q. 105. Will you explain why you slitted pistons like Exhibit 8 and used them instead of making them up like shown in Exhibit 1 in 1911? A. Excelsior Motor Manufacturing Company at that time was in the hands of creditors committee or a receivership and I had instructions from the chairman of the committee to make no expenditures on experimental work for automobile motors, as it was the intention to discontinue the manufacture of automobile motors in event of the receivership being dismissed. Therefore, I could not make up any special constructions.

Q. 106. Was the Excelsior plant sold, and if so, when, and to whom? A. Excelsior plant was sold to a man by the name of Schwinn of Chicago, about the first of November, 1911, and I turned over the keys to him November the 11th, 1911.

Q. 107. When did you leave the employ of the Excelsior Company? A. About one week following turning over the keys to Mr. Schwinn.

Q. 108. Will you give your reasons for putting standard pistons back in the motor of this car after the

removal of the Exhibit 8 pistons? A. One of the reasons was that it was not a standard piston and could not be sold as such to any of Excelsior Motor Company's customers; another was in order that all motors were to be disposed of, and no others were to be manufactured by the Excelsior Company; further, as I, as the inventor of the idea, I considered it was of value, and as it was designed on my own time, it was my desire to hold it; further, I did not know what Schwinn's attitude might be in connection with the motor end of the industry.

Q. 109. Did you make any other sketches of slitted pistons than Exhibit 1, prior to November, 1911? A. I did not.

Q. 110. When did you conceive the idea as shown in Exhibits 1, 2 and 8? A. In the latter part of 1908.

By Mr. Kingsland: The answer of the witness is objected to and it is moved that it be striken out on the ground that it fails to conform to the preliminary statements. [57]

By Mr. Fletcher: The same objection.

Q. 111. Will you state just what particular construction you conceived in 1908, and state why you did not proceed with it at that time? A. In 1908 I was manufacturing automobiles with the Amplex Motor Car Company of Mishawaka, Indiana. We were building a two cycle motor, were having a great deal of trouble with pistons, owing to the fact that they were of large bore and being of two cycle construction, the pistons became very hot, caused considerable trouble from expansion, causing scoring, and when loose enough to operate properly, under these heat conditions were noisy, slappy. I conceived the idea of splitting these pistons the same as Exhibit 8, but upon investigation I found it would not work in a two cycle motor, as the port hole bridges were very narrow, and the diagonal slot would uncover the exhaust ports on the compression stroke and cause the charge which was compressed in the base of the motor to leak out. This made it impracticable with that particular motor. At about that time we were considering also the manufacture of a four cycle motor and it was my intention to develop this piston for that purpose. However, as we did not enter the field of four cycle motors up until the time I left the Amplex Company in 1910 I had no chance to further carry out the idea until I became connected with the Excelsior Motor Manufacturing Company.

Q. 112. How were you engaged between November 1911 and the fall of 1913? A. I was in Syracuse, New York, through the early part of 1912, and back in Chicago in the fall of 1912. I was also back and forth between the east and Chicago up until the middle of 1913. I was engaged with one party by the name of Pulsifer in an attempt to organize an automobile company to take over the Amplex Motor Car Company of Mishawaka, which was about to go into the hands of a receiver. This effort, however, did not mature, and it was some time later before we were successful.

Q. 113. What, if anything, did you propose to do through the company which you were to organize with respect to your invention illustrated in Exhibits 1, 2 and 8? A. It was our intention to manufacture a [58] sleeve-valve motor, which I had sketched up and to incorporate in its construction pistons of a split sleeve type.

Q. 114. How did the piston which you planned to install in these motors compare with that illustrated in Exhibit 1? A. It was practically the same as Exhibit 1, with the exception of possibly minor mechanical details.

Q. 115. Did you and Mr. Pulsifer finally succeed in getting a plant? A. We did.

Q. 116. What plant, and when? A. We purchased the plant of the Amplex Motor Company, Mishawaka, Indiana, from the receiver, M. W. Mix, and took official possession shortly after the 1st of May, 1914.

Q. 117. What was the product of this plant at the time you took it over? A. Automobiles.

Q. 118. What kind of motor was used in these automobiles? A. We discontinued the use of the two cycle motor and was using six cylinders Buda four cycle motor.

Q. 119. What kind of pistons were used in these Buda motors? A. Standard gray iron pistons.

By Mr. Richey: I now produce a blue print which is marked for identification, Gulick's Exhibit No. 9.

Q. 120. What does this Exhibit 9 show? A. It shows a type of split piston as designed to use in the E. J. G. motor.

Q. 121. Under whose instruction was the tracing of this print made? A. The original drawing was made under my instruction, and was carried out through Chief Engineer Winchester.

Q. 122. When was the original drawing made? A. Shortly after the—it was made prior to June, 1914.

Q. 123. Where was it made? A. Made at the plant of the Amplex Manufacturing Company, Mishawaka, Indiana.

Q. 124. Did you see it made? A. I saw the drawing as it was being made and when it was completed. It had to pass my approval before being used.

Q. 125. What does the date 6-24-14 on the Exhibit 9 indicate, if anything? A. It means sixth month, twenty-fourth day, year of 1914. [59]

Q. 126. What does it indicate with respect to the completion of the original drawing? A. It means that that is the day the tracing was completed, but does not indicate the date which the paper drawing was made, as this record is supplied only when the tracing is made.

Q. 127. Whose initials are the letters B. E. R. on the bottom of this drawing? A. Bert E. Rockhoff, the man who made the tracing.

Q. 128. Do you know the whereabouts of the original drawing or the tracing from which Exhibit 9 was made? A. I do not.

Q. 129. Do you remember seeing the tracing? A. I saw both the tracing and the drawing prior to the making of the print. This tracing and drawing, with other drawings in connection with this motor, were in the files of the Amplex Motor Company, and they were taken over by the receiver, about November 1st, 1914, and as I had nothing to do with the business after that, do not know what became of them.

Q. 130. The original drawing and the tracing showed the same construction as Exhibit 9, didn't they? A. They did.

Q. 131. When did you first come into the possession of the print, Exhibit 9? A. Shortly after it was made, in July, 1914. As I took copies of all prints made as fast as they were produced, as we were using some of the blue prints in connection with this sleeve motor for promotion purposes.

Q. 132. In whose handwriting is the matter in ink in the lower right hand corner? A. My handwriting.

Q. 133. Will you explain how the piston shown in the Exhibit 9 operated and what it did, or how it was proposed to operate? A. It was proposed to operate practically the same as the piston shown in Exhibit 1; however, the design in Exhibit 9 is mechanically very much

refined, and was designed as shown on Exhibit 9, to be made of gray iron.

Q. 134. There is on the back of this tracing in rubber stamp, "Rec'd—by Buda-Drafting-Dept. Aug. 20 1915." Do you know how this stamp happened to be on there? A. I do.

Q. 135. Will you explain how? A. I forwarded Exhibit 9 to the Buda Motor Company with the idea of [60] enlisting them in the manufacture or use of this piston in their motor, the date of which it was received by the Buda Motor Company, as indicated, was August 20, 1915. It must have been mailed at least two days prior to this.

Q. 136. There is written in your handwriting on the lower right hand corner of this drawing certain descriptive matter: when was that placed on Exhibit 9? A. This handwriting which is an explanation of the operation of the piston, was placed there shortly after my receiving Exhibit 9 in June, 1914, for the purpose of explaining to parties we were attempting to interest in the company its operation.

Q. 137. Will you please read this descriptive matter on the record? A.

"Cross Head Type

Piston in which the Barrel is Split to provide for expansion and of which the Barrel is severed from the head and held by rib which carry the pin Bosses.

Design of Piston which automatically provide for Expansion and contraction without scoring or cutting and permits the piston being ground to practically the same size as cylinder Bore prevents all trouble in fitting and eliminates all piston pounding also wears cylinder more uniform.

It is ideal construction for aluminum pistons as expansion is taken care of without excessive clearance in fact practically no clearance other than a running fit is provided for. Same applies to Gray Iron."

Q. 138. To whom, if anyone, was this descriptive matter disclosed? A. It was disclosed to a number of prospects we were trying to interest in financing the Amplex Manufacturing Company; also to the Buda Motor Company, Harvey, Illinois, and Packard Motor Car Company.

Q. 139. Did you disclose it to Mr. Milton Tibbetts of the Packard Company about March the 25th, 1916, at the

same time you disclosed Exhibits 1 and 2 to him? A. I did.

Q. 140. Who put the B3 on Exhibit 9, if you know? A. I do not know. [61]

Q. 141. Where was the print during the intervening period? A. It was in the—prior to my turning it over to Packard, it was in the possession of the Buda Company for quite a period of time. I cannot recall the exact time, but it was necessary for me to write them for it on two occasions before it was returned. After it was returned it was in my possession until turned over to the Packard Motor Car Company, in March, 1916.

Q. 142. Did Mr. Pond or Mr. Offield see Exhibit 9? A. They did not.

Adjourn until 10:00 o'clock tomorrow morning.

South Bend, Indiana, July 22, 1926. Met pursuant to adjournment. Present, same as before.

Q. 143. Have you been able to think of anything else by which you can identify the time when Exhibit 1 was made by you? A. Yes.

Q. 144. Will you state it? A. In making up this sketch, it was the first time that I gave any personal attention to the mechanical features of a motorcycle motor, and as the development of these motors for racing purposes was going on, in sketching up Exhibit 1, I had in mind the general form of the motorcycle piston, and pictured the sketch about the same as the piston used in the motorcycle, that is, as to shape and dimensions. I never did any other work on a motorcycle except to follow it through until the time it was tested, which was some time prior to July, 1911.

Q. 145. At what other time during your career, except the first part of 1911, did you work on any design relating to motorcycles? A. Never before, or never after.

Q. 146. Who went with you to the Elgin races in the summer of 1911? A. Morris Engle.

Q. 147. Did you attend the opening of the motordrome in Chicago in July, 1911? A. I did.

By Mr. Richey: I offer in evidence as Gulick's Exhibit No. 9, the drawing so marked for identification.

By Mr. Kingsland: To the introduction in evidence of Exhibit No. 9 objection is made on the ground that it is not competent and has not been sufficiently proven. [62]

By Mr. Richey: I produce a blue print and ask that it be marked by identification Gulick Exhibit No. 10.

Q. 148. Will you look at Exhibit No. 10 and state what it shows? A. Exhibit No. 10 shows a sectional view of the E. J. G. motor.

Q. 149. What kind of a piston is shown in it? A. The same piston as shown and described in Exhibit 9.

Q. 150. I notice the piston in Exhibit 10 shows no vertical slit; can you explain this? A. The piston shown in Exhibit 10 is shown in half-section and the fact that a small portion of the slot, that is the vertical slot, which would show in that section of the barrel of the piston, was merely an error in tracing.

Q. 151. Under whose direction was the original of Exhibit 10 made? A. It was authorized by me and made under the direction of an engineer by the name of Winchester.

Q. 152. Who made the original? A. Winchester.

Q. 153. When and where was the original made? A. It was made at the plant of the then Amplex Motor Car Company, in the early part of the year of 1914.

Q. 154. Did you see them working on this drawing at that time? A. I did.

Q. 155. In the lower right-hand corner of Exhibit 10 there are the initials of F. U. W. Whose initials are these? A. Those are the initials of Winchester.

Q. 156. Where is the original of this Exhibit 10? A. The original and the tracing were with the—were in the possession of the company when it was taken over by the receiver in November, 1914. I never saw them after that.

Q. 157. Do you know anything about the history of Exhibit 10 itself? A. It was in my possession until—after the receivership, until I turned it over to the Packard Motor Car Company, in March, 1916.

Q. 158. That is, it was turned over to Mr. Tibbetts at the same time that you delivered to him Exhibits 1, 2 and 9? A. Yes.

Q. 159. When did Exhibit 10 first come into your possession? A. Prior to June, 1914. [63]

By Mr. Richey: I offer in evidence as Gulick's Exhibit No. 10 the drawing which was so marked by identification.

By Mr. Kingsland: The offer in evidence of Exhibit No. 10 is objected to as incompetent and immaterial. It obviously does not show the subject matter of the counts of the interference.

By Mr. Fletcher: Same objection.

Q. 160. Were any of these split skirt pistons made by you or under your direction in 1914? A. Yes.

Q. 161. How many? A. Six were completed and put in a motor.

Q. 162. Will you describe those pistons? You may refer to Exhibits 9 and 10 if you wish. A. The pistons referred to were similar to Exhibit 8, with the exception that there was two ribs extending from the head to the bosses, and that the slot was cut through and down to the ribs, completely around the piston below the lower ring, and the skirt was slotted diagonally.

By Mr. Richey: I ask that the sketch which I now produce be marked by identification, Gulick Exhibit 11.

Q. 163. Will you compare the pistons which you say were made in 1914 with this drawing, Gulick Exhibit 11? A. They were the same construction as shown in Exhibit 11.

Q. 164. When and by whom was Exhibit 11 made? A. That was made November the 8th, 1922, by me.

Q. 165. Where and for what purpose was it made?

By Mr. Kingsland: The question is objected to as immaterial, as it relates to a paper produced or made subsequent to the filing date of all parties involved in the interference, and can be nothing more than a self-serving paper.

A. It was made in Cleveland, Ohio, for the purpose of showing the construction of the six pistons which were placed in a six cylinder motor at the plant of the Amplex Manufacturing Company in 1914.

Q. 166. And it depicts your recollection of those pistons in 1922, does it not? A. It does. [64]

By Mr. Richey: I offer in evidence as Gulick's Exhibit 11 the drawing so marked for identification.

By Mr. Kingsland: The introduction in evidence of Exhibit No. 11 is objected to on the ground that it is incompetent and immaterial.

By Mr. Fletcher: The introduction in evidence of Exhibit No. 11 is objected to on the ground that

it is immaterial and therefore unwarranted, as it is subsequent to the filing date of the applications involved in these interferences.

Q. 167. Will you explain why the 1914 pistons were made like that illustrated in Exhibit 11 instead of that illustrated in Exhibits 9 and 10? A. The piston as made in Exhibit 11 was made from a standard piston pattern, and the only change was in the inserting of the double ribs, tying the bosses more securely to the piston head. The object in making these pistons was to give them a trial in aluminum, and not go to the expense of making up expensive patterns designed as shown in Exhibit 9, as these pistons were not to be used in the E. J. G. motor. They were installed for test purposes in a six cylinder Buda motor.

Q. 168. Who made the pistons? A. The castings were made at the Rockhoff Foundry in Mishawaka. They were machined up in the plant of the Amplex Manufacturing Company, and were installed in a motor in this plant.

Q. 169. Do you know who machined them? A. I do not.

Q. 170. Did you see them at any time between the time they were cast and the time they were installed in the motor? A. I did.

Q. 171. How many times? A. More than once; I don't know how many.

Q. 172. Had they been machined when you saw them? A. I saw them before they were machined, while they were being machined and after they were machined.

Q. 173. Who installed them in the motor? A. A man by the name of Hoadley, I think.

Q. 174. Did you see them installed? A. I did not, but saw the pistons sitting on the floor beside the car [65] when he was preparing to make the installation, but was not present when he put them in.

Q. 175. What was done with the motor after the pistons were installed in it? A. The car was taken out on the road and ran for a period of time until they were later removed.

Q. 176. How long, how far and at what speeds was the car run with these pistons in it? A. It was ran at various speeds up to sixty miles an hour, and at least a mileage of four thousand miles. It ran from about July until just prior to the receivership in November, 1914.

Q. 177. Do you remember any particular trip that you took with this car while these split pistons were in the motor? A. I took many trips: one to Chicago, and a number of times to various places in Indiana, on fishing trips.

Q. 178. What kind of a car was it? A. Amplex car.

Q. 179. You drove it yourself, did you? A. I drove it, and I owned it.

Q. 180. How do you fix the date when these pistons were installed in this car? A. I fix the date because it was in the summer of 1914 prior to the receivership.

Q. 181. That is, the Kamm receivership? A. Yes.

Q. 182. How did these Exhibit 11 pistons operate in the car? A. They operated perfectly up until just prior to the time at which they were removed. They were removed because the piston pins had pounded themselves loose in the piston bosses.

Q. 175. At what clearances were the Exhibit 11 pistons fitted in the cylinder walls? A. It would be impossible to state the exact clearance, but they were fitted just as close as they could be gotten into cylinders without driving them in; by this I mean, the fit was as close at they could be forced in by hand.

Q. 176. Did you see the pistons then or after they were removed from the motor? A. I did.

Q. 177. What was their condition? A. They were in perfect condition as far as the exterior was concerned, the only defect being in the piston pin bosses.

Q. 178. No scoring or cutting? A. None whatever.

Q. 179. The defect was not due to the slitting, was it? A. It was not. [66]

Q. 180. To what was it due? A. It was due to the fact that the piston pin bosses were too light, and also that the piston pins were not properly fitted.

Q. 181. Who removed the pistons from the motor? A. I do not know.

Q. 182. Of what material were the pistons made? A. Supposed to be of manganese aluminum.

Q. 183. Why do you say they were supposed to be manganese aluminum? A. Because manganese aluminum was being experimented with at that time for that purpose and Mr. Rockhoff advised that is what he used.

Q. 184. As a result of your examining the pistons, what kind of material would you say they were made of? A. I would say aluminum without making an analysis.

Q. 185. Did the pistons slap any while in use? A. They did not.

Q. 186. What became of these pistons? A. They were there until the time of the receivership; after that I do not know what became of them.

Q. 187. How many people knew about the making and use of these 1914 Exhibit 11 pistons? A. There was not more than I should say ten employees in the factory, and would say that the only people who were really familiar with them were the people who did the machining and installing. The balance of the employes probably knew something about it.

Q. 188. You have spoken of the Kamm receivership; will you state when this occurred, and briefly the circumstances under which it occurred? A. The receivership took place in November, 1914, and was brought about by the inability of the Amplex Manufacturing Company to retire a bond.

Q. 189. Will you state your reasons for not at that time making more pistons like the Exhibit 11 pistons? A. The Amplex Manufacturing Company at the time these pistons were made were strictly engaged in disposing of automobiles made prior by the Amplex Motor Car Company. There were no Amplex motors for these cars, and in disposing of them they were equipped with standard Buda six cylinder motors, and it was not the intention of installing these pistons as shown in [67] Exhibit 11, to use them as regular product. It was merely for experimental and demonstrating purposes.

Q. 190. I believe you said you were busy during the latter part of 1914 and the first part of 1915 in trying to get back the Amplex Company, and then became engaged in the—in your present employment, and that, in the meantime, in 1915, you had submitted your piston to the Buda Company and thereafter and in the first part of 1916 to the Packard Company; when was the deal by which your invention was assigned to the Packard Company consummated? A. I don't remember the date.

Q. 191. You had negotiations with Mr. Tibbetts, with Mr. Rector, with Mr. McCauley and various other people between March, 1916, and the consummation of the deal with the Packard Company, did you not? A. I did.

Q. 192. Will you state as near as you can recollect the date of each of these conferences, with whom the conferences were had, for what purpose they were held, and what was the result of the conferences? A. From the time I turned the various exhibits over to Mr. Tibbetts and until the time the deal was finally closed I had

a number of conferences with—through Mr. Pond and with Messrs. Rector and McCauley. I was in and out of Chicago on these conferences at various times during the period, but cannot give the dates; and these conferences were in relation to the sale of the exhibits as well as various other patents. As some of these other patents were held by Kamm, the receiver, I was delayed considerable in rounding them up and in securing them for Packard Company. This delay, of course, held up the whole deal for a considerable period of time.

Q. 193. I now hand you a file of correspondence; will you state whether or not you wrote any of these letters? A. I wrote all letters bearing my signature.

Q. 194. The other papers are copies of letters addressed to you; did you receive such letters? A. I did.

By Mr. Richey: The letter dated March the 27th, 1916, corresponds to the copy referred to heretofore as Gulick's Exhibit 3. The carbon copy is offered in evidence as Gulick's Exhibit 3. The [68] other letters are offered in evidence as Gulick's Exhibits 12, 13, 14, 15 and 16 respectively. They will further be identified by Mr. Tibbetts.

Q. 195. If these letters refresh your recollection as to any of the events which transpired during your negotiation for the sale of your piston invention to the Packard Company which you have not already related, will you refer to them and tell us about them? A. As I previously stated, in attempting to close the transaction with the Packard Company, a proposition was first made to them in which Exhibit 1, with the various other exhibits, were to be purchased. While these negotiations were pending a number of patents were in possession of Kamm, the receiver, which they wished to dispose of. They approached me on the subject, and I advised the Packard Company I could secure a number of these old patents. However, when the time came for the Kamms to deliver there was two or three of the patents that they did not want to dispose of, which they had originally agreed to let me have. Not being able to deliver these, as per my statement to the Packard Company, after the proposition had been made covering the whole number of patents, it was necessary to revise the deal with the Packard Company. Even then the deal did not then go through as planned, owing to the fact that the Kamms again changed their mind as to the number of patents they were to turn over to me. This condition existed

for some time, until the final settlement and turnover of the patents from the Kamm Company to me made it possible to close the deal.

Q. 196. Are the facts stated in these letters correct? A. They are.

Q. 197. Was the twenty-nine hundred dollars referred to in Mr. Tibbetts' letter of March the 27th placed in Mr. Rector's hands for you in the spring of 1916, to be paid to you contingent upon your being able to deliver with a clear title the patents and inventions set forth in that letter? A. It was.

Q. 198. State whether or not you knew it, in the spring of 1916? A. I knew it, as I was so advised by Mr. Pond, that they were ready to take it over. [69]

Q. 199. Had you disclosed the piston shown in Exhibits 1, 2 and 9 to the Packard Company, or any of them, prior to March, 1916? A. I had.

Q. 200. Which one? A. Mr. Tibbetts.

Q. 201. Which one of the Exhibits 1, 2, or 9? A. I—prior to March I had not shown Mr. Tibbetts Exhibits 1, 2 or 9, but I had talked with Mr. Tibbetts about the split piston, and also the motor, as I was trying to interest him in taking them over. Shortly after or about the time at which I closed my suit with the Packard Company in 1915 I had lunch with Mr. Tibbetts in the Auditorium Hotel, Chicago, and explained to him the piston and motor. At that time he was not particularly interested, but took it up with the Packard engineers, and later, about March 1916, we got together and that is the time that I turned over the Exhibits 1, 2, 9 and 10 to the Packard Company.

Q. 202. Had you, prior to March, 1916, sent a print like Exhibit 9 to the Packard Company? A. I might have done so; I do not know; if so, there would be some correspondence evidencing same.

Q. 203. Can you tell from the letters when the deal with the Packard Company was closed? A. No.

Q. 204. You were hired by Fred C. Robie to work for the Excelsior Company, were you not? A. I was.

Direct Examination Closed.

Cross Examination by Mr. Kingsland.

XQ. 205. Mr. Gulick, do you know who prepared the application upon which you are involved in this interference? A. Mr. Tibbetts.

XQ. 206. Did you furnish him the date upon which the application was prepared? A. None other than has been shown in Exhibits 1 and 2.

XQ. 207. In addition to that, had you had any personal conferences with him before the application was prepared? A. Only such conferences as were had pending our negotiations.

XQ. 208. Do you recall, whether upon any of these conferences, you gave to Mr. Tibbetts any information relative to the subject matter of the invention that would supplement or add to the disclosures of Exhibits Nos. 1 and 2? A. I have no recollection of such [70] disclosures.

XQ. 209. Then so far as you now remember the only information relative to the invention of your application given to Mr. Tibbetts was the contents of Exhibits 1 and 2, is that correct? A. The contents of Exhibits 1 and 2 and 9.

XQ. 210. You desire, then, to correct your answer to XQ. 206 and add thereto Exhibit 9 as the extent of disclosure to Mr. Tibbetts, is that correct? A. Yes.

XQ. 211. To summarize the matter then, Mr. Tibbetts, so far as you now remember, had before him Exhibits 1, 2 and 9, without any further information or without any other disclosures when he prepared your application, is that correct? A. It is not correct. Mr. Tibbetts had in his possession at the time Exhibits 1, 2, 9 and 10, from which he undoubtedly prepared the application. However, during the preparation of this application, I did not have any conference with Mr. Tibbetts.

XQ. 212. I understand from your last answer that you now desire to supplement or change your answer to XQ. 210 by adding Exhibit 10 thereto, is that correct? A. My first answer in reference to Exhibits 1 and 2 I was referring particularly to the written explanation in Exhibit 2 and not to all of the exhibits that were in his possession.

XQ. 213. Have you now stated all of the data that was before Mr. Tibbetts, so far as you now remember, at, before or during the preparation of your application?

Objection by Mr. Richey: Objected to as incompetent unless the witness was present when Mr. Tibbetts prepared the application.

A. All of the written data that I know of, written or printed data that I know of.

XQ. 214. Do you know of any verbal data or information that Mr. Tibbetts had from you in addition to the written or printed data at the time stated in the last preceding question? A. None other than might have come up in verbal conversation before or at the time I turned the exhibits over to him.

XQ. 215. But I understand from your answer to XQ. 208 that you have no recollection of giving to Mr. Tibbetts any additional verbal information in [71] relation to the invention, is that correct? A. I have no recollection of having talked with Mr. Tibbets or seeing him after turning over the exhibits until he forwarded the application to me for my signature.

XQ. 216. Did you give to anyone connected with the Packard Company any verbal explanation in addition to the Exhibits that you have referred to in further or fuller explanation of the invention prior to the receipt of the application papers for your signature? A. I did not.

XQ. 217. Mr. Gulick, do you understand the subject matter of the counts involved in interference No. 49,569 and 49,570.

By Mr. Richey: Let the record show that counts have not been shown to the witness by examining counsel.

By Mr. Kingsland: The witness is privileged to examine the counts.

By Mr. Richey: We object to the question as incompetent; it is not the function of the witness to interpret the counts.

By Mr. Kingsland: The witness is produced apparently to establish his dates of invention, has made preliminary statements, and is assumed to be familiar with the subject matter of the invention.

By Mr. Richey: We produced the witness to prove the facts he has testified about, and not to interpret the counts. That is the function of the tribunal who reviews this record.

A. Not having seen them before, and not understanding the terms in which they are set forth, I do not understand them.

XQ. 218. Will you refer to Exhibit No. 1 and indicate what you consider are the "means for joining the bosses and the cylinder engaging parts together," which is stated in the language Count 2 of interference number 49,569? A. In Exhibit 1, ribs 3 and 4 are the members which unite the bosses, skirt and the head.

XQ. 219. Will you please point to such language or other information contained in the Exhibits 1, 2, 9 and 10 that you have mentioned that characterize these means that you have just mentioned as resiliently yieldable? A. The ribs or webs 3 and 4 and the skirt 2 are [72] yieldable to an extent sufficient to perform service for which they are designed.

XQ. 220. Where is this information found in the exhibits that you have referred to? Namely, Exhibits 1, 2, 9 and 10. A. In Exhibit 1 it is shown by the ribs 3, 4 and the skirt 2; in Exhibit 9 it is shown in the ribs and skirt, the same as in Exhibit 1; in Exhibit 10 the same structure ribs are shown as in 1 and 9, the mechanical details, however, being more refined in 9 and 10 than in sketch Exhibit 1.

XQ. 221. Does your written description in Exhibit No. 2 give any information as to the yielding characteristics of the ribs 3 and 4?

Recess until 2:00 o'clock P. M.

By Mr. Richey: Notice is given that we will call as a witness Mr. Harvey Williamson of Elkhart, Indiana, who was referred to by Mr. Gulick.

A. It does. In paragraph 1, Exhibit 2, it reads, "Body 2, which provides bearing surface and which is split as indicated by 7 to provide for expansion." And in paragraph 2 it reads, "Body 2 is machined as close to sides as is possible to make a fit, and any expansion is taken up by the slot 7." Were it not for the slot 7 the heating up of the body of the piston would expand it to such an extent, if fitted as close to the cylinder as is mentioned in Exhibit 2, and cause it to seize. The slot provides for the skirt to close up. In other words, the slot makes possible a degree of flexibility in the structure which would not exist were the body of the piston made solid. It is a well known fact that all metals are inherently flexible, and it is obvious that a piston of this structure could not be otherwise than to a degree flexible. All pistons for engines when finished sized, even though they are not split, are flexible. They cannot be contracted under their normal size at the temperature at which they are finished, but will expand beyond that size. However, they may be perfectly round, but can be taken in the hand and with a slight pressure, thrown out of round a very few thousandths, which would evidence that all structures of this nature are to some degree flexible.

However, this flexing does not provide for the amount of contraction necessary for a piston to run free if [73] fitted as close as would be fitted with a split skirt. I further refer to Exhibit 9, which reads, "Design of piston which automatically provides for expansion and contraction." Also reads, "which is ideal construction for aluminum piston, as expansion is taken care of without excessive clearance." Withot the slot it would be impossible to fit the pistons as close as they may be fitted with the slots. Therefore it is obvious that a degree of flexibility sufficient to care for the operating requirements exists, and which is one of the prime objects in the invention.

XQ. 222. When you say in your last answer that it is obvious that a degree of flexibility exists, does this necessarily mean that the flexibility exists in the ribs as well as in the skirts in pistons of the type shown in Exhibit 1? A. It does.

XQ. 223. Was it your intention to disclose in the application upon which you are involved in this interference the same invention as was disclosed in Exhibits 1, 2, 9 and 10? A. The application for invention I presume was drawn from these exhibits. I did not draw up the application and did not draw up the specifications. The disclosure in Exhibits 1, 2 and 9 fully cover the object of the invention.

XQ. 224. At the time you prepared Exhibit No. 2 did you know of the manner in which the ribs would flex as described by you in your answer to XQ. 221? A. I did, from an engineering standpoint. I knew in which direction they would flex.

XQ. 225. Did you consider the requirement that the ribs would flex in order to perform the objects and function of the structure shown in Exhibit 1 was essential?

Objection by Mr. Richey: In asking the witness for his opinion counsel makes the witness his own.

By Mr. Kingsland: The witness has on direct examination presumed to express opinions as to the functioning of the device and the examination in relation to the functioning is entirely proper as purely cross examination.

A. I knew of necessity the ribs would have to flex in some degree to permit of the skirt closing.

XQ. 226. What explanation have you for failing to directly mention the flexible characteristic of the rib [74]

when you prepared Exhibit 2? A. I did not consider that it was necessary to attempt to patent an ordinary piece of material, cast iron or aluminum, inasmuch as the material used in these structures was inherently flexible. I further did not know it was possible to patent an inherently flexible metal or material, as far as the flexible feature is concerned. The construction of these pistons, and the slotting, automatically provides, in connection with the flexibility of the material, for the difference in degree of expansion.

XQ. 227. Do you consider it essential, and did you so consider it at the time you prepared Exhibits 1 and 2, that the skirt should be slotted in order to carry out the objects of the invention? A. Yes.

XQ. 228. Do you recall the circumstance of the execution of the application by you upon which you are involved in this interference? A. I do. But I do not recall the readings in the application exactly, but do know what they purport to express. These application papers were only in my possession for my signature, mailed to me from Detroit from the Packard Motor Car Company and were returned to them. I have never seen them since, or a copy.

XQ. 229. Did you read the specification and examine the drawing before you signed it? A. Yes, I read it. But I do not recall now how it read; or, in other words, the wording of the application.

XQ. 230. At the time you signed it did it express, in your opinion, the accurate disclosure of the invention? A. Yes.

XQ. 231. Referring to Exhibit 1, what elements designating them by the number used on the exhibit, forms the connection between the piston pin bosses and the skirt of the piston? A. Ribs 3 and 4.

XQ. 232. What do you understand the word "rigid" to mean?

By Mr. Richey: This line of examination is not germane to the direct examination and counsel makes the witness his own; moreover, the witness is being asked to interpret the claims and specifications which is the function of the patent office, and objection is made to the question on that ground also. [75]

By Mr. Kingsland: The witness has testified that the specification expressed an accurate disclosure of the invention. Obviously counsel has a right to inquire as to the witness' understanding of the use of language in the specification.

A. Rigid, absolutely immovable, absolute inability to flex.

XQ. 233. I will now ask you to consider the language appearing in the third paragraph of page four of your original specification that reads as follows:

> "It will be seen that in addition to providing a piston with a split skirt, the above described construction also provides an extremely rigid connection between the piston pin bosses and the skirt of the piston, which construction may be used either with or without the split skirt and separated head."

Do you consider that the above language accurately describes or discloses the invention as shown in your Exhibit No. 1 and described in your Exhibit No. 21 (Counsel hands witness certified copy of the Gulick file-wrapper contents which witness examines.) A. It does describe the invention and the fact that the ribs are mentioned as rigid between the piston pin bosses and the skirt does not detract from the flexible feature, owing to the fact that it was quite necessary that a rigid structure or as near so as possible be incorporated in the direct line of thrust sidewise for the connecting rods. The ribs in connection with the piston and the bosses and as attached to the head when the piston was flexed or closed at the slot would flex more or less between the head and the bosses. The skirt body would flex between the ribs, permitting it to close at the slot, and the ribs would close in; they would not flex to any perceptible degree lengthwise of the rib across the piston.

XQ. 234. I will now ask you to examine the entire original specification and point out such language therein as you consider justifies the theory of operation given in your last answer. A. I will not attempt to interpret the language of the specification. However, I see nothing in this specification that does not describe the invention and its relations to a split piston providing for expansion and contraction. [76]

XQ. 235. In answer to XQ. 227 you said that you considered the slotting of the skirt an essential in order to carry out the objects of the invention. In the language that I quoted in XQ. 232 it was stated that the structure may be used either with or without the split skirt. Did you consider it accurate to set forth in the specification that an operative structure could be made to accomplish the object of the invention without a split

in the skirt? A. The structure shown, that is, the interior ribs, could be incorporated in the piston without the split skirt. However, in such case it would not be flexible. With the split skirt, the structure becomes flexible as shown in Exhibit 1 and as expressed in the application.

XQ. 236. Has the thickness of the ribs anything to do with the flexibility thereof, I am referring of course to a piston such as shown in Exhibit No. 1? A. The thickness of the ribs would have some bearing on the degree of flexibility; by that I mean, the thinner the section of rib the less would be the tension, and the thicker the rib the higher would be the tension and less susceptible to easier degrees of flexibility.

XQ. 237. If the metal of the ribs were made of such a thickness that the cylinder wall pressure failed to overcome the rib tension would the piston seize? A. If it were a rib sufficiently heavy that there was absolutely no flexibility in a direction parallel to the piston head, the structure would then be in that direction rigid, and if fitted to the cylinder as closely as permitted by the flexible structure as in the application, it would undoubtedly score on the sides adjacent to the end of the piston pins. However, the split in the skirt between the ribs would afford relief for that portion of the skirt, but could not afford relief for the sides of the piston adjacent to the pin, and by this explanation I mean a rigid structure parallel with the piston pin.

XQ. 238. When you talked with your wife about this matter did you explain to her the fact that the ribs would be flexible, or did you stop short of that full explanation? A. I explained to her fully that the structure of the skirt and ribs below the head were of a flexible nature. [77]

XQ. 239. But you failed to make this explanation, so far as you remember, as I understand your testimony, to Mr. Tibbetts or anyone connected with the Packard Motor Car Company, is that correct? A. I cannot say that I mentioned the word "flexible" in connection with this design to Mr. Tibbetts. I do not know. However, it might have been mentioned in some of our talks prior to my making the deal with them and turning over the papers. I did not mention it to anyone else connected with the Packard Company. The structure in itself evidences its flexible nature.

XQ. 240. On your direct examination you stated that you made the first set of pistons following Exhibit No. 1 for a motorcycle motor. Did those pistons vary in any detail from the showing of the Exhibit No. 1? A. They did.

XQ. 241. Please describe the differences between the showing of Exhibit No. 1 and the pistons that you made for the motorcycle motor. A. The pistons used in the motorcycle motor were constructed the same as Exhibit No. 8, and were made from a standard Excelsior motorcycle piston.

XQ. 242. They had no flexible ribs connecting the bosses with the head and the bosses with the skirt, had they? A. No, the flexation was entirely in the skirt.

XQ. 243. When you answered Q. 20 you stated that you made a set of pistons of Exhibit No. 1. In view of your last answer do you consider your answer to Q. 20 accurate and a fair statement of the facts? A. The answer to Q. 20 is an error. This is the correct answer to Q. 20: None other except that we made a set of split pistons for a motorcycle motor which was block tested to be used in a racing motor prior to the official opening; further, the pistons used in this test were of the standard racing type and were split to develop the split skirt idea, but were not ribbed exactly as shown in the sketch.

XQ. 244. Was it your custom to date sketches of inventions devised by you prior to 1911? A. It was.

XQ. 245. Did you have any reason for omitting the date on Exhibit No. 1? A. None whatever. The [78] specifications, however, Exhibit 2, I had not quite completed, and it is probably the reason why the date was not affixed.

XQ. 246. In your answer to Q. 34 you mentioned a suit against the Packard Motor Car Company. What was the general nature of that suit, and where was it pending? A. It was a suit against the Packard Motor Car Company for royalties on rear axle structures and the suit was filed in Chicago.

XQ. 247. In your conferences relating to the transfer of your inventions to the Packard Company, did you confer with anybody connected with that company other than Mr. Tibbetts? A. No one directly connected with the company but Mr. Tibbetts.

XQ. 248. During the prosecution of the application upon which you are involved in this interference, after

it was filed, did you confer with Mr. Tibbetts concerning the subject? A. I have no recollection of any correspondence or any consultation on the subject after it was filed. However, he may have brought up some question, and not having preserved Tibbetts' letters, I do not know.

XQ. 249. Did you authorize any amendments in the case after it was filed? A. I do not know that I did. That is, I don't remember.

XQ. 250. Did you have anything to do with the transfer of the application from the Packard Company to the present owner? A. I did not.

XQ. 251. When did you first learn that claims in the case were directed to the flexible feature of the rib? A. I don't know that the question of the particular flexibility of the ribs was brought up until this deposition was being taken.

XQ. 252. Before that time you did not consider the particular flexibility of the ribs as part of your invention, as I understand it, is that correct? A. I did not consider the word "flexible ribs" inasmuch as the general structure shown in the application shows—indicates a flexible structure in relation to the split skirt.

XQ. 253. In answer to XQ. 226 you stated that you did not think it possible to patent an inherently flexible metal or material, was this the reason that you did not mention to Mr. Tibbetts the flexible characteristics [79] of the ribs? A. I think Mr. Tibbetts was as well aware of the flexible nature of the structure as I was, and I do not think that it occurred to him or anyone else to attempt to cover an inherently flexible material. The structure in itself provides all the necessary flexibility.

XQ. 254. Were you of the opinion in 1922 that the flexible characteristic of the rib was merely an inherent quality of the metal out of which they were made? A. I was always of the opinion that the design of the structure in connection with the flexibility of the material was all that was necessary to produce a proper working piston. It is necessary that the material be flexible; if not, when the piston skirt was closed it would stay in that position and be of no further use. It must be flexible to conform to the uses to which it was put.

XQ. 255. Did you at any time during the prosecution of the application examine any of the amendments that were filed? A. I do not know that I did.

XQ. 256. Will you say that you did not? A. I will not state that I did not or that I did. I do not know.

XQ. 257. I refresh your memory by referring you to a photostat of a supplemental oath filed as a part of your application and dated November 8, 1922, and will ask you whether this recalls any circumstances connected with the prosecution of the case? A. It recalls no circumstances, but I did execute the supplemental oath. However, it had slipped my mind, having no record that I did so.

XQ. 258. In this oath you state that you had read the application as it stands amended after the filing of the amendatory paper filed September 11, 1922. Do you recall any circumstance of reading the amended application? A. None except that I probably read it over and signed it and returned it.

XQ. 259. In your last answer, when you say "it" do you mean your supplemental oath? A. Yes.

XQ. 260. You have no independent memory of examining any other papers at that time? A. No.

End of Cross Examination by Mr. Kingsland.

It is agreed by all the parties that the balance of Mr. Gulick's testimony may be taken stenographically by Mr. Batson and written up by him. [80]

Cross Examination by Mr. Fletcher.

XQ. 261. In your answer to Q. 13 you have stated that in addition to showing and exhibiting Exhibit No. 1 to your wife, you also disclosed it to one or two other parties. Do you now recall who the other parties were? A. They were friends of mine who lived in the immediate neighborhood.

XQ. 262. Can you give their names? A. I can give their names, but it don't seem to be warranted; the idea is, two of them were women.

XQ. 263. What are their names? A. One was Mrs. Smith and the other, Mrs. Grubb. Their husbands also visited my house on numerous occasions and knew of it, but not sufficiently familiar with it to be able to testify.

XQ. 264. Two of them—both of them? A. Yes.

XQ. 265. Did you disclose Exhibit No. 1 to the husbands of these women? A. I believe I did, yes.

XQ. 266. Prior to 1911 was it customary with you to have sketches and the like which you disclosed to

others attested or witnessed by such others? A. Sometimes I did and sometimes I did not.

XQ. 267. Is Exhibit No. 1 the basis used in the preparation of your application for letters patent, and in which application the counts of the interferences are involved?

By Mr. Richey: Objected to as incompetent; the application itself is the best evidence.

A. It is probable that Exhibit 1 and Exhibit 9 were used in the preparation of the application.

XQ. 268. Was Exhibit No. 2 used in the preparation of the application? A. I don't know; but I expect it was.

XQ. 269. In the last paragraph of Exhibit No. 2 it is stated:

"The head, 1, is machined small enough to allow for expansion and not bind or seize, while the body, 2, is machined as close to size as is possible."

Do you recall whether this statement was made in your application filed in November, 1917? [81]

By Mr. Richey: Objected to; the application itself is the best evidence.

A. I do not know.

XQ. 270. At the time that the Excelsior Company was preparing for the races at the motordrome at Chicago and you were making a piston to go into the motorcycle motors to be used in the races, what type of a piston were you working on at that time? A. It was a standard type motorcycle piston, split the same as Exhibit 8, practically the same as Exhibit 8.

XQ. 271. Where were the pin bosses disposed in the piston like Exhibit 8? A. In about the same position below the ring head as in Exhibit 8, in the same position.

XQ. 272. Then they were extended from the skirt of the piston? A. They extended inwardly from the skirt of the piston.

XQ. 273. In your answer to Q. 20 you stated in part: "Were not ribbed exactly as shown in this sketch."

The Witness: In "the" sketch or in "this" sketch?

Mr. Fletcher: This sketch.

XQ. 274. Where were these ribs disposed and how, with respect to the piston, Exhibit No. 8? A. There was one small rib extending from the head down to the piston pin boss, and two very slight projecting ribs extending partially around the piston from the pin bosses.

XQ. 275. Were there any ribs extending transversely from the pin bosses to the skirt? A. No. Now, I don't know what you call transversely in this case. Look at it yourself. That is an entirely different thing. That doesn't extend down.

XQ. 276. I mean transversely, something like that —that is not Exhibit 8, is it? A. No.

By Mr. Richey: It is requested that the piston produced by the witness and referred to in the preceding answer be marked for identification, Gulick Exhibit 17; and it is so marked. [82]

XQ. 277. My previous question was directed to Exhibit No. 8. Were there any ribs extending transversely from the pin bosses of Exhibit No. 8? A. Not like the ribs shown in Exhibit 1. Exhibit 17 shows the interior construction of the ribs.

XQ. 278. When was the first time you made a piston like the disclosure of Exhibit 1? A. First piston made of practically the same structure as in Exhibit 1 was—patterns were made from Exhibit—patterns and castings were made from Exhibit 9. The piston, however, never was machined or finished. In the year of 1914.

XQ. 279. With respect to the type of piston you have described as the Renault, Exhibit No. 8, as you have stated that some of them were put in a motor and used in the motor races at Elgin, Illinois—was the motor races well patronized? A. They were.

XQ. 280. Were you there from day to day? A. I was there one day.

XQ. 281. Then you only speak of the races being patronized for one day? A. That is all. The day on which I was there with the Renault. The Renault, however, was not driven in the races; it was driven to the races, to visit the races, from Chicago, and return, in one day.

XQ. 282. How far did you state that these Renault pistons like the Exhibit No. 8 were operated as to mileage of an automobile driven by the motor in which the pistons were mounted? A. Why, I believe I said some-

thing around possibly three or four thousand miles; I don't just remember. It was driven fully that much; might have been more.

XQ. 283. The longest trip that you took was that in which Mr. Williamson was along, was it not? A. It was the longest single trip.

XQ. 284. In your answer to Q. 110 you stated, "in the latter part of 1908," with reference to conceiving the idea in Exhibits 1, 2 and 8. Can you further state, in more detail, as to what the idea was? A. The idea was to simply split the skirt, practically the same as [83] shown in Exhibit 8. But it wasn't practical to use in a two cycle motor, and was not used because we didn't build four cycles.

XQ. 285. Were all of your ideas on splits at that time the same as that shown in Exhibit 8, in which the diagonal slot extends into the transverse slot? A. That was the general idea of the split construction.

XQ. 286. Was this your car that the pistons of the type Exhibit 8 were mounted in at the time of the Elgin races? A. It was not.

XQ. 287. Who did the car belong to? A. Belonged to the Excelsior Motor Manufacturing Company.

XQ. 288. What type of a car was it—touring or closed car? A. Five passenger open touring type car, Renault type of design.

XQ. 289. Was the car used in connection with the Excelsior Company's business? A. It was.

XQ. 290. How long did you say that the car was used at the time that the motor had the pistons of the type shown in Exhibit 8? A. From just prior—the day prior—from the day of the Elgin races, until shortly after the first of October in 1911.

XQ. 291. How many pistons did you make of the type shown in the sketch, Exhibit No. 11? A. There was possibly fifteen or eighteen castings made of this type before we succeeded in getting enough sound ones to make six good pistons, and one extra.

XQ. 292. When were those pistons cast? A. Well, they were cast prior—these were cast, I should say about July, 1914; along about the first of July, 1914.

XQ. 293. And those that were machined, were they machined shortly thereafter? A. They were machined as fast as they were cast until we got enough good ones. Exhibit 11, however, is not a drawing of the piston; it is merely a sketch showing the type of construction.

XQ. 244. Did you have another drawing of the piston? A. No drawing was ever made of the piston.

XQ. 245. Then Exhibit 11 was the first sketch or drawing made, is that correct? A. No. There was a sketch made of the bosses and how they were to be incorporated in a piston pattern which was either [84] owned by the Amplex Motor Car Company or by the Rockhoff Foundry. There was no drawing made of the piston, as it was a standard type; merely a sketch of the bosses and how they were to be placed in the piston, the machining of the rings and so forth. Overall dimensions and otherwise were copied from a Buda piston, and the slotting was done by merely an explanation as to how they were to be slotted.

XQ. 246. When was this sketch which you have just mentioned made? A. Oh, it was made probably sometime in June, the latter part of June, 1914, about the time the pattern was fixed up and the castings made; only possibly two or three days was required to do the whole job.

XQ. 247. Was the Buda piston which you have just mentioned slotted? A. It was not.

XQ. 248. In Interference No. 49571, count one thereof, it states in part:

> "A tying means extending from each of said wrist pin bearings, each being cooperably connected at their opposite ends to said cylinder engaging portion."

Can you describe this construction on Exhibit 1?

By Mr. Richey: Objected to as not germane to the direct examination, and as asking the witness to execute the function of the patent office.

A. On Exhibit 1 it would be shown as ribs 3 and 4, tying the pin bosses to the skirt of the piston.

XQ. 249. Can you describe what is meant by the cooperable connection of the tying means with the skirt, with respect to Exhibit 1?

By Mr. Richey: Same objection; counsel makes the witness his own.

A. I hardly know how to express this cooperable connection, unless it was where the rib was connected to the skirt of the piston, and independently, each rib being independent of the other rib.

Adjournment at 5 o'clock until 9:30 o'clock tomorrow morning. [85]

Friday, July 23, 1926; 9:30 o'clock A. M.
Deposition resumed.

XQ. 250. By your answer to Q. 23, I take it, then, that you never made a piston like that disclosed in Exhibit No. 1 at that time, is that correct? A. We made the piston patterns and the castings, but we never machined them up.

XQ. 251. But the time you have reference to in your answer to Q. 23 is the year 1911? A. Yes; that answer to Q. 23 is 1911. But, now, in this one back of this, was that referring to Exhibit 1 or Exhibit 9?

XQ. 252. Exhibit 1. A. I want to get back to that question then.

The notary reads XQ. 250.

A. I never made a piston in 1911 like Exhibit 1, as far as the rib structure is concerned. The piston made in '11 and referred to in Q. 23 was a standard type slotted, the same as Exhibit 8.

XQ. 253. In your answer to Q. 42 you stated that you did not recall showing Exhibit 2 to anyone but your wife prior to showing Exhibit 2 to Mr. Offield, whereas in answer to and XQ. you stated that you showed it to two other parties. Which of these answers is correct? A. In showing it to my wife, she was the only one that was familiar, by my explanation, with its construction. The other parties mentioned, being neighbors, saw it, as previously stated, but were not qualified to understand it. For that reason, in my first answer I did not mention them. I had forgotten the circumstances.

XQ. 254. In your answer to Q. 73 you stated with reference to Exhibit 8 that they were made in 1911. Was this the first time you made a piston having a slotting of the character shown in Exhibit 8? A. No.

XQ. 255. When was the first time you made a slotting of the character shown in Exhibit 8? A. The motorcycle piston that was made in 1911 was slotted prior to Exhibit 8.

XQ. 256. How much prior to the slotting of Exhibit 8? A. I don't know the exact number of days.

XQ. 257. In your answer to Q. 73 you stated it was in July, 1911, that pistons like Exhibit 8 were made. [86] Does this refresh your memory as to when others were made prior to this date? A. Exhibit 8 was made in

July, and the motorcycle piston of similar construction was made earlier; was made before Exhibit 8.

XQ. 258. But it was in 1911, wasn't it? A. It was in 1911.

XQ. 259. Which of the original drawings of Exhibits 9 and 10 were made first? A. Ten was made first.

XQ. 260. As I understand it, the original drawings of Exhibits 9 and 10 were made after you and Mr. Pulsifer took over the Amplex Company from the receiver, is that correct? A. The drawings were started prior to our taking over the Amplex plant, as negotiations were not completed until about May, 1914, and draftsmen were working on this type prior to the closing of the negotiations.

XQ. 261. Where were the original drawings made of Exhibits 9 and 10? A. Made in the plant of the Amplex—They were started in the plant of the Amplex Motor Car Company, Mishawaka, Indiana, and finished in the plant of the Amplex Manufacturing Company, same place.

By Mr. Richey: Same plant?

The Witness: Same plant, in 1914.

XQ. 262. After the receivership of the Amplex Motor Car Company in 1914 you have stated that you sent Exhibit 9 to the Buda Company, and that later you corresponded with the Buda Company for the return of Exhibit 9. Have you any of the correspondence had between you and the Buda Company with respect to the return of Exhibit 9? A. I have not.

XQ. 263. Did you have any correspondence with them—that is, letters from the Buda Company? A. I did at the time.

XQ. 264. Then you do not know where said letters are, do you? A. I haven't the letters in my files. I presume, however, the Buda Company has copies of their replies to me, and possibly my letters.

By Mr. Richey: You searched for your files, did you?

By the Witness: I haven't any. Exhibit 9 indicates that the Buda Company received the [87] print, as it is stamped on the back, the date which they received it.

XQ. 265. In count 3 of Interference No. 49571 part of the language thereof reads as follows:

"And the skirt portion being split longitudinally of the piston to permit free expansion and contraction."

Can you, by referring to Exhibit 1, point out the elements that would permit the expansion and contraction of the skirt portion?

By Mr. Richey: In asking the witness to interpret the claims, counsel makes the witness his own.

A. Ribs 3 and 4 would flex or give to some extent above the piston pin in the narrow section shown in A which connects the bosses and the head. The skirt body, 2, would flex at the back side opposite the slot. Ribs 3 and 4 would also flex slightly. And the whole structure lends itself and adapts itself to a degree of flexibility. It was designed for that purpose.

XQ. 266. You have mentioned the ribs 3 and 4 which lead to the body portion or skirt 2, said ribs obviously forming a support to the skirt. Would not such connection of the ribs 3 and 4 to the skirt provide a reinforcement to the skirt? A. They would provide a reinforcement, but not a rigid reinforcement.

XQ. 267. But would they permit the skirt to be free? That is, so as to have free expansion, such as unrestrained expansion.

By Mr. Richey: Will counsel explain to the witness what he means by "unrestrained"?

By Mr. Fletcher: "Unrestrained" means where a part is free to act without being held back.

By Mr. Richey: The question is objected to as immaterial.

A. If the structure was of such a nature that it would expand or contract and not react it would be of no value.

Mr. Fletcher: That is all. [88]

Re-Direct Examination by Mr. Richey.

RQ. 268. During your cross examination you referred to the motor piston marked Exhibit 17. When did this piston come into your possession? A. I never saw this piston until yesterday, July 22nd.

RQ. 269. Day before yesterday Mr. McCoy wired for the piston and the blue print which I hand you and which I have marked by identification No. 18, did he not, and they were received yesterday noon? A. That is what I understand.

RQ. 270. The type of piston exemplified by 17 and illustrated by 18 is a type of motorcycle piston that the Excelsior Company was using in the first part of 1911, aren't they? A. Yes.

RQ. 271. About the time you made Exhibits 1 and 2? A. Yes.

RQ. 272. How do the proportions of the piston illustrated in Exhibit 1 compare with the proportions of Exhibit 17 and the piston illustrated in Exhibit 18? A. The overall dimensions are very close.

RQ. 273. That is, the actual dimensions or the proportions? A. The actual outside dimensions and general proportions, not considering the rib structure.

RQ. 274. I believe you stated it was your intention that the piston which you illustrate in Exhibit 1 was to be used in substitution for pistons like 17, and that illustrated in 18, is that correct? A. That is right.

RQ. 275. Now, you also said, I think, that it was pistons like Exhibit 17 that were modified by slotting them in 1911—that is correct? A. Yes.

RQ. 276. Will you mark on this piston, Exhibit 17, and on the drawing, Exhibit 18, how those pistons were modified?

(The witness marks said Exhibits with red pencil.)

A. That is close enough to show it, isn't it? I have so marked them with red pencil.

RQ. 277. At the bottom of Exhibit 9, below, the illustration of the piston, is the word "cast iron," and during the description it is stated that this is an ideal construction for aluminum. If the piston illustrated in [89] Exhibit 9 was made of cast iron or aluminum state whether or not the webs would be flexible and yieldable. A. They would.

RQ. 278. During your cross examination by Mr. Kingsland you were interrogated regarding your application. Will you look at the drawing of this application and state what would happen to the webs shown therein if the piston expanded? A. When the piston expanded naturally the circumference of the skirt would increase and the webs would flex slightly to meet these requirements.

RQ. 279. I call your attention to the statement at the bottom of page 3 of the specification, as follows:—

"In order that the skirt may not expand an undue amount when the piston is heated, as under

operating conditions, it is split longitudinally as at 21."

What would happen to the webs when the piston operated as described in the quotation which I have read from the specification? A. As soon as the skirt had expanded a sufficient amount to take up any clearance which might exist between the cylinder walls and the skirt, then the material would flex, then the structure would flex and the split would absorb the surplus expansion.

RQ. 280. By "structure" you mean the webs? A. Webs and the whole structure in connection with the skirt.

By Mr. Kingsland: Last question and answer objected to on the ground that it is leading, and move that it be stricken out.

RQ. 281. The specification further says that one of the objects of the present invention, "is to provide a piston which will not expand against the cylinder wall to such an extent as to seize or stick."

"Another object of the invention is to provide a piston with a skirt or guide portion slightly separated from the head of the piston and split longitudinally so that it will not expand in circumference with force great enough to cause the piston to stick in the cylinder." [90]

What would happen to the webs of the piston illustrated in the drawing of your application if it operated and realized these objects? A. As soon as the skirt had expanded to the cylinder walls as far as it could go the balance of the expansion would be taken up by the slot and necessarily the ribs would flex slightly between the head and the piston pin bosses; and also the ribs extending crosswise would flex to a very slight extent, sufficient to make the device operative.

RQ. 282. When Mr. Kingsland called your attention to the supplemental oath I think you didn't note that the same had been executed in Cuyahoga County, Ohio. Will you look at this oath now and state whether or not that fact refreshes your recollection as to the execution of the same or the consideration of the amendatory paper filed September 11, 1922? A. I, at the time of answering the question, did not recall having signed this paper, this amendment. However, when it

was brought to my attention, I did sign it in Cleveland, and I read it before I signed it or I never would put my signature to it, as I am not in the habit of signing any papers or attaching my signature until I read them. I signed this paper in Cleveland on November the 8th, 1922, the day on which I made sketch Exhibit 11, which was the only time I have been in Cleveland on this subject matter. I didn't give this subject much attention, outside of reading it over, as I was not so much interested in it as I was in the earlier developments of the piston. I had forgotten the circumstances.

RQ. 283. The Exhibit 9 refers to the E. J. G. motor. State whether or not that was adopted as standard equipment by anybody. A. It was adopted by the Amplex Manufacturing Company as standard equipment, and was intended to be used with the Amplex cars.

RQ. 284. And as standard equipment it was to include the piston shown in Exhibit 9, which you state was a part of it? A. It was.

RQ. 285. State whether or not patterns were made to make castings for the pistons shown in Exhibit 9. A. They were.

RQ. 286. When were they made, do you know? A. Castings were made in the—they were made after July, and a short time prior to the receivership. I just can't state the date. [91]

RQ. 287. Do you know who made them? A. I do not.

RQ. 288. Were any castings made from those patterns? A. There was.

RQ. 289. How many? A. Well, it was a six cylinder motor and there was some surplus castings made. I don't know just how many.

RQ. 290. Do you know who made them? A. I do not.

RQ. 291. Who made the patterns? A. The patterns were made in South Bend, were made here, by either the South Bend Pattern Works or the Peerless Pattern Company.

RQ. 292. When were the castings made? A. They were made sometime after July and prior to the receivership in November.

RQ. 293. What was done to the castings? A. Nothing. They were received at the factory but were never machined.

RQ. 294. Why not? A. Because of the receivership.

RQ. 295. Where are the castings now? A. I don't know.

RQ. 296. What was the purpose in making them? A. To put them in the motor, in the E. J. G. motor.

RQ. 297. To machine them up and put them in the E. J. G. motor? A. Yes, to machine them up and put them in the E. J. G. motor.

RQ. 298. You testified about your efforts to recover your company from the Kamm receivership. Will you state more in detail what you did after the receivership in November, 1914, in an effort to recover the company. A. Shortly after the receivership in November, 1914, Mr. Pulsifer and I were engaged in attempting to take it out of the hands of the receivership. Mr. Pulsifer consulted some attorneys in Chicago, and I consulted Mr. Graham of South Bend on the subject. We had no way of forcing them to accept our terms, and we attempted to raise enough money to buy it back, but times at that time, money was rather close and investors were not very fast in lining up with such a proposition. We worked on the subject and made ovations to Kamm, the receiver, and we visited him on several occasions up [92] until about April, 1915, and as we didn't succeed in getting anywhere, he finally advised us that he was going to operate the business, at least temporarily, which he did. We then ceased our attempts to finance it. And that was the end of it, as far as we were concerned.

RQ. 299. State whether or not you used any pasteboard in making the patterns for the pistons shown in Exhibit 11, and if so, how.

By Mr. Kingsland: This line of examination is objected to as clearly improper redirect examination; the last several questions have covered matters that should have been brought out in direct, if at all.

A. Pasteboard was wrapped aroupd the patterns to increase their size sufficient to machine, as the original pattern was slightly smaller than the bore of the Buda motor.

RQ. 300. You were asked during your cross examination about the piston of the patent application. I show you a piston which I mark for identification Exhibit 19. Will you state whether or not in your opinion this is a fair representation of what is shown in the patent application drawing and what is described in the application. A. It is.

RQ. 301. State whether or not that is in your opinion a fair representation of what you disclosed to Mr. Tibbetts. A. It is.

RQ. 302. State whether or not it is a fair representation of what is disclosed in Exhibit 9. A. It is.

RQ. 303. You were asked during your cross examination about that trip you and Mr. Williamson took. I show you a photograph which I have marked for identification, Exhibit 20. Will you state what this shows? A. This is a picture of the Renault type car which was owned by the Excelsior Motor Company and which was fitted with split type pistons. This picture was taken on the road when we were near Michigan City on a trip which Mr. and Mrs. Williamson and my wife and I made to Mishawaka in the latter part of September, 1911.

RQ. 304. Who were the people in the car, as shown in this picture? A. My wife in the front seat, Mrs. Williamson in the rear seat. The one on the left is my wife and the one on the right is Mrs. Williamson. [93]

RQ. 305. Have you read the counts of this interference and do you understand the same? A. I have and I do.

RQ. 306. Are you the inventor of the subject matter of the counts?

By Mr. Kingsland: The question is objected to as incompetent and calling for a conclusion of the witness.

By Mr. Fletcher: The same objection.

A. I am.

RQ. 307. Are you financially interested in the outcome of this controversy or any of them? A. I am not.

RQ. 308. I show you some drawings marked Exhibits A2 and A3 which I will have marked for identification, Gulick's Exhibit 21 and Gulick's Exhibit 22 respectively. What do these drawings show? A. These are right and left hand views of the E. J. G. motor and the same motor as shown in section in Exhibit 10. The prints might be somewhat confusing as both views were made from the original tracing, but it will be noted that the pump is shown as on one side and the magneto on the other.

RQ. 309. That is the motor that is referred to in Exhibit 9, isn't it? A. Same motor.

RQ. 310. When were those prints, Exhibits 21 and 22, made? A. Early part of 1914.

RQ. 311. You were asked during your cross examination regarding the Amplex car which you had in 1914. Did you look last night at your home for a bill of sale, showing when you purchased this car? A. I didn't look for the bill of sale because I didn't know that I had it, but as I had just finished papering our house I was putting some wall paper away in the garret and I ran onto a box that had some old wall paper and some letters in it, and amongst the junk was this bill of sale.

The paper referred to by witness as "this bill of sale" is marked for identification Gulick Exhibit No. 23.

RQ. 312. Will you refer to Exhibit 23 and state just what it is and what it covers? A. It was a bill of sale given to me by the Amplex Manufacturing [94] Company, signed by Mr. Randall, and covered the Amplex car which I purchased from the company at that date, July 16, 1914, and is the same car in which the split aluminum pistons were installed. This car was driven for several hundred miles prior to my purchasing it and the new pistons were in the car when I took it over on this date.

RQ. 313. Is there anything about the bill of sale which refreshes your recollection as to whether or not the pistons were in the car when you bought it? A. There is. They not being standard, I requested Mr. Randall to exhibit the mileage of the car and also the fact that there were other pistons in it; which he did.

RQ. 314. And what were those other pistons? A. They were split pistons, aluminum pistons.

RQ. 315. Like Exhibit 11? A. Like Exhibit 11, yes.

RQ. 316. Who made the red ink notations on this bill of sale, if you know? A. I don't know; either Mr. Randall or his assistant, I presume.

RQ. 317. This notation reads, "Miles speedometer 816; new type pistons in moto.," and on the back I find the following notation, "R. Fernegan. This mileage, 6112, when car was left in garage and was not driven but little after until Cook received it. E. J. Gulick." Who made the notation on the back of the bill of sale, Exhibit 23? A. I did.

RQ. 318. Do those notations refresh your recollection as to how far this car was driven with the pistons like Exhibit 11 in them? A. They do.

RQ. 319. Can you state nearer than you did before what was that mileage? A. The split pistons were taken out prior to the receivership sale in November, 1914, and the standard type Buda pistons inserted. I can not tell just how many miles it was driven after that before it was sold to Cook, but it was driven very little. So the mileage in which the split pistons were used would be the difference between the 816 indicated on the bill of sale and the time which they were removed. As the car was laid up nearly all winter I doubt if it was driven more than two or three hundred miles before the sale, and this would leave apparently around forty-five hundred miles or in that neighborhood of actual operation for the split pistons. [95]

By Mr. Richey: The motorcycle piston marked by identification Gulick Exhibit 17 is offered in evidence as Gulick's Exhibit 17.

The blue print of the same marked for identification Gulick Exhibit 18 is offered in evidence as Gulick Exhibit 18. The piston marked for identification Gulick Exhibit 19 is offered in evidence as Gulick Exhibit 19.

The photograph marked for identification Exhibit 20 is offered in evidence as Exhibit 20. The bill of sale produced by the witness and marked for identification Gulick Exhibit 23 is offered in evidence as Gulick Exhibit 23.

By Mr. Kingsland: The offer in evidence of Exhibit No. 19 is objected to on the ground that it is incompetent, the date of its structure not having been established and not having been connected in any wise with the subject matter involved.

By Mr. Fletcher: The offer in evidence of Gulick Exhibit No. 17 is objected to on the ground that it has not been identified for the reason that the witness said that he had never seen it before.

The offer in evidence of Exhibits 18, 19, 20 and 23 are objected to on the ground of being improper redirect examination.

RQ. 320. When did you make the notation on the back of the bill of sale, Exhibit 23? A. My recollection is this was made in the early part of 1915; at any rate, it was after Cook had purchased the car. That date I am not absolutely clear upon.

By Mr. Richey: Redirect examination closed.

Re-Cross Examination by Mr. Kingsland.

RX. 321. This Exhibit No. 11, in your opinion, does it embody the subject matter of the counts of these interferences?

By Mr. Richey: I object as incompetent. That is the function of the patent office.

By Mr. Kingsland: Counsel has interrogated this witness on the construction of the counts and has requested his opinion as to whether he is the [96] inventor thereof and has asked him to apply structure to the counts.

By Mr. Richey: The witness was cross examined as to certain matters, as a result of questions by which counsel made the witness his own, but he was not asked to interpret the counts.

By Mr. Kingsland: It is impossible to see how this witness could construe the counts and state that he was the inventor of the subject matter without involving a construction of the counts. The witness has not been made a witness for Hartog, but has been questioned on cross examination entirely within the scope of the direct examination.

By Mr. Richey: That part of the cross examination which asked for an interpretation of the counts and explanations of the terms of the counts and words in the counts had no bearing whatsoever on the direct examination, which related entirely to the facts, and counsel made the witness his own and now seeks to escape the responsibility of doing so.

A. It does to the extent of the functioning of the split skirt. However, in the structure it doesn't show or have the ribs of the same construction as shown in Exhibit 1.

RX. 322. Was there ever made a structure as shown in your application drawing that embodied the entire structure of the ribs supporting the bosses and the split skirt? A. There was.

RX. 323. When was that made? The castings were made in the fall of 1914.

RX. 324. Were they ever tried out? A. They were never machined up and tried out.

RX. 325. Did you ever make any measurements to determine whether or not the rib structure was flexible? A. I never did.

RX. 326. The opinions that you have expressed are absolutely theoretical? A. They are not.

RX. 327. What actual facts have you upon which you base the opinions that you have expressed? A. From an engineer's viewpoint, any structure, it would be only reasonable to believe that such would be the case; further, the fact that the split skirt as tried out in [97] Exhibit 8 and later as constructed in 1914 and like Exhibit 11 confirmed our beliefs.

RX. 328. Exhibit 8 relies upon flexibility of the skirt wall entirely to perform its function, does it not? A. It does.

RX. 329. Can a piston of Exhibit 8 in your opinion be fitted as closely as a piston as shown in your application drawing? A. As I have never tried out a structure as shown in Exhibit 1, I could not say. However, from the experience of Exhibit 8 in the Excelsior motor, the same as Exhibit 11 in the Buda motor, I would say it would be very close.

RX. 330. In other words, you would get the full result or approximately the full result from the use of the piston shown in Exhibit 8 as you would in a piston shown in Exhibit 1, is that correct? A. You would get a good result, but not as perfect a result.

RX. 331. Where would the result differ? A. There would be a more uniform expansion of the skirt as designed in Exhibit 1 than as experimented with in Exhibit 8.

RX. 332. You are expressing that opinion from an engineering and theoretical standpoint, and not from anything that you know from actual tests of the fact, is that correct? A. From actual tests of Exhibit 8 and Exhibit 9 and Exhibit 11, not having finished up one like Exhibit 19; but from the performance of these other latter two, I would say the construction as of 19 would be superior in its functions to 8 and 11 and that it would work perfectly.

RX. 333. Do you know of a piston of the construction of Exhibit 19 ever having been put in actual use? A. I do not.

RX. 334. Exhibit 19 has the ribs running parallel to each other and in a straight line, has it not?

By Mr. Richey: I object. The piston is in evidence and is the best evidence of how the ribs run. The patent office can see this from the exhibit.

A. They have.

RX. 335. The pistons that you say were made and not completed following the general structure of [98] Exhibit 19, did they have the ribs curved or straight? A. They were straight.

RX. 336. With a structure such as 19 is the circumferential expansion and contraction of the skirt uniform throughout the length of the circumference? A. I would not say that it is absolutely uniform, as it would be almost impossible or practically impossible to unite any form of rib and tie to the piston pin bosses and have a perfect cylindrical contraction or expansion.

RX. 337. Where would the greatest point of wear occur or points of wear? A. The greatest points of wear on a piston occur on the thrust sides which are at right angles with the pins.

RX. 338. Isn't it also true that they would occur on a line in the plane of the ribs? A. That would be at right angles with the pin on the thrust side, which is the natural point of wear; and the object of the rib is to carry the load and transmit it to the skirt in that position.

RX. 339. Considering the thrust side, would there be any difference in the lines of wear in the arc represented by the thrust side in piston 19? A. The thrust side always carries the most wear owing to the excessive load over the free running or compression side.

RX. 340. I think that you probably misunderstood the last question. Will you consider the question again and make an effort to answer it?

The notary reads RX. 339.

A. I can only state that there would be very little wear on the sides in a plane with the pin; there would naturally be more wear on the thrust side, which would be at right angles with the pin, and which would be the pressure position of the skirt in relation to the ribs. As far as there being any distinguishing lines after the structure had seated itself to the cylinder walls, there would be practically no difference.

RX. 341. How close was the piston of Exhibit 8 construction fitted in the cylinder of the engine? A. They were fitted just as close as they could be machined and made to slide through freely dry. This does not include the head portion carrying the rings, as ample [99] clearance was given to the head portion, as in all cases of all pistons, to prevent any chance of seizing where there is no means for expansion.

RX. 342. The supplemental oath that was inquired about on cross examination and re-direct was executed at Cleveland, was it? A. It was.

RX. 343. What were the circumstances under which it was executed, if you now recall? A. I don't recall just what the circumstances were. I was in Cleveland and I was at the offices of—I don't know whether it was Gehr or who it was, but I was up to somebody's office up there anyway, and we were simply talking over the situation, or talking over this piston structure, and the amendment papers were given to me and read over, and I read them over and signed them. I had no recollection of it; I had forgotten all about it.

RX. 344. Was the supplemental oath prepared by Mr. Tibbetts or by someone else? A. I can't say who it was prepared by.

RX. 345. By whom was it submitted to you? A. I don't know who gave it to me and handed it to me.

RX. 346. In whose office was it submitted to you? A. Well, that I can not say because, to the best of my recollection, the name of the institution was—well, there was a Watts connected with it; I guess that is about all I remember, somebody and Watts, as I recall it. I don't know what the name of the business was, whose the attorney's office was, but Watts, I guess, and Mr. Slough.

RX. 347. Were these gentlemen partners of Mr. Richey who is representing your application here? A. I can't say that; I don't know.

RX. 348. What building was it in, do you know? A. No, I do not.

RX. 349. At whose request did you go to Cleveland? A. That I don't know.

RX. 350. Was the Pomeroy Hartog interference mentioned to you?

By Mr. Richey: Objected to as immaterial and counsel makes the witness his own.

A. Pomeroy Hartog? It was not. [100]

RX. 351. Are you positive of that? A. I am. I don't know that I ever heard the name before until I heard it today, heard it in this case if I heard it at all.

RX. 352. Did you know at that time any interest in the invention had been assigned to other parties than the Packard Company? A. I did not.

RX. 353. Did you learn later that it had been? A. I learned that some sort of a deal had been made by the Packard Company, but didn't know what it was; don't know today who owns it.

RX. 354. Did the parties at whose request you executed the supplemental oath purport to represent the Packard Company at that time? A. Well, I can't say as to that either.

RX. 355. Did you have anything to do with the making of Exhibit No. 19? A. I did not.

Mr. Kingsland: That is all.

Re-Cross Examination by Mr. Fletcher.

RX. 356. Am I to understand that the red lines which you have sketched on Exhibit No. 17 with respect to the slotting of the piston is identical with the slots or slotting of Exhibit 8? A. The same general character.

RX. 357. Then from what you say, the type or kind of slotting made in Exhibit 17 as indicated by the red lines was the first slotting made by you on pistons, is that correct? A. That is correct.

RX. 358. What position did Mr. Randall hold with the Amplex Motor Company? A. Well, he was sort of a—he was manager for the receiver, and when he went with us he was a director and stockholder and served as factory manager.

RX. 359. Was he director and stockholder of the company at the time he receipted the bill of sale marked Exhibit 23? A. He was.

RX. 360. Where is Mr. Randall now? A. I don't know, but believe he is in Toledo.

RX. 361. At the time you signed the supplemental oath referred to in the cross examination of Mr. Kingsland were you advised by anyone of a certain [101] patent having issued before November, 1922, as relating to a slotted piston? A. I was not.

Mr. Fletcher: That is all.

Re-Direct Examination by Mr. Richey.

RQ. 362. When, with respect to the sale of the car covered by the bill of sale of July the 16th, 1914, Exhibit 23, were the split pistons put in the car? A. Right immediately after the car was purchased.

RQ. 363. They were not in the car at the time you purchased it, were they? A. No, they were not.

RQ. 364. The split skirt pistons that were put in the car were yours before they were put in the car, weren't they? A. They were my personal property;

I paid for them, as I had made no assignments of any patents or designs or appliances to the Amplex Manufacturing Company, or at any time up to the receivership in 1914.

RQ. 365. That is, you mean you paid for the castings? A. I paid for the castings; and also I paid for the castings through the Amplex Company.

Mr. Richey: That is all.

Re-Cross Examination by Mr. Kingsland.

RX. 366. At the time you got the bill of sale, Exhibit No. 23, was the pistons of Exhibit No. 11 installed in the car? A. They were installed in the car the day it was sold to me.

RX. 367. Well, when was the payment for the car made in relation to the date that you got it? A. Payment for the car was made, the money was turned over to the company some, oh, I should say a week or ten days prior to the bill of sale, as I had advanced the company some money and this was a consideration for the money that I had advanced to the company.

RX. 368. In other words, you had a credit with the company? A. Yes.

RX. 369. And the credit was absorbed by taking over the car? A. That was it.

RX. 370. Did you make any separate payment for the pistons that were installed in the car, or was it [102] all covered by one purchase price? A. No, it was not covered by one purchase price. I purchased the car as it was at that time with the Buda pistons in it and the pistons as were put in it, the split pistons as were put in it like 11, were my personal property, and, as I recollect, they were billed to the Amplex Manufacturing Company and I paid for them; but they had nothing to do with the sale of the car.

RX. 371. Did you pay a separate consideration for the pistons to the Amplex Company? A. I did. I paid for the material and paid for the work that was done on them.

RX. 372. Have you any paper showing the transaction of the purchase of the pistons as a separate item? A. I have not.

RX. 373. But you are sure that there was a separate memorandum of purchase for the pistons, is that correct? A. Positively sure.

Deposition Closed.

Edward J. Gulick. [103]

PLAINTIFFS' EXHIBIT NO. 66.

Patent Office List of Applications of Long.

(Filed January 27, 1934.)

(Attorney's Room, Jun 29 1925 U. S. Patent Office.)

(Docket Division Jul 2 1925 U. S. Patent Office)

To the Hon. Commissioner of Patents:

Please permit the H. H. Franklin Manufacturing Company of Syracuse, New York, or its authorized agent or attorney to inspect the files and make copies of the papers therein of each of my pending applications as follows:

Serial Number	*Title*	*Filed*
231,786	Case "A"	May, 1919
281,175	Case "D"	March, 1919
304,283	Case "E"	June 14, 1919
317,273	Case "F"	August 13, 1919
339,892	Case "G"	November 22, 1919
375,673	Case "H"	April 22, 1920
437,690	Case "I"	January 17, 1921
432,719	Case "J"	December 23, 1920
522,974	Case "L"	December 17, 1921
602,660	Case "M"	November 22, 1922
624,463	Case "N"	March 12, 1923

Signed at Detroit, State of Michigan, this 13th day of April, 1925.

(Seal)

LONG PISTON CORPORATION
Elmer C. Long
President
Elmer C. Long

WITNESS:
Fred G. White

PLAINTIFFS' EXHIBIT NO. 67-B.

Opinion of Examiner in Interference No. 49,569.

(Filed January 27, 1934.)

Final Hearing March 23, 1928.

In the United States Patent Office.

Patent Interference No. 49569.

Hartog v. Long v. Gulick.

Pistons.

Application of Stephen D. Hartog filed February 16, 1920, No. 359,137.
Applications of Elmer C. Long filed August 13, 1919, No. 317,273; filed March 7, 1919, No. 281,175.
Application of Edward J. Gulick filed November 30, 1917, No. 204,661.

Messrs. Rippey & Kingsland for Hartog.
Messrs. Swan, Frye & Murray for Long.
Mr. Ray S. Gehr for Gulick.

The interference includes two counts, count 2 having originally constituted the sole count of Interference No. 49,572, consolidated herewith October 8, 1925. The two counts read as follows:

Count 1: A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

Count 2: A piston having a head with top and side walls in combination with a guide structure

connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

The inventions defined by these counts constitute two of the numerous efforts to construct pistons for internal combustion engines of aluminum or aluminum alloys. Because this material has a large coefficient of expansion it was found that a plain piston would be either too small when cold or too large when hot. Special structures have been designed to counteract the tendency of the pistons to expand and these two counts define two of such structures.

Hartog does not dispute priority with Gulick but contends that Gulick did not disclose the invention of these counts in his application as filed. With respect to count 1 it was ruled by the law examiner on April 4, 1924, that the Gulick application disclosed the invention. With respect to count 2 the law examiner made a similar ruling on the same date, his opinion on this count being Paper No. 40 in Interference File 49,572. There is no evidence which was not before the law examiner from which it could be inferred that Gulick has no right to make the counts. The matter, therefore, is not open for reinvestigation by the examiner of interferences (Rule 130). This question has been discussed somewhat more fully in an opinion of even date herewith made in Interference No. 49,570. That discussion is relevant particularly to count 2 of the present interference.

Long bases his case for priority over the November 30, 1917, filing date of Gulick on what he designates as his type "F" piston for count 1, and his type "D" piston for count 2.

Concerning the type "F" piston it is stated in brief for Long on page 18 that he testifies to conception in March or April, 1917, and explanation to others about the same time, that he personally made up several of the pistons in his shop in Hannibal, Missouri and installed a set of the pistons early in 1917 in the car of one Sprick and in Franklin motors. Long's testimony is found in his record (pp. 211 to 224) and it does not include a particle of contemporary evidence supporting the 1917 date.

It is entirely clear that an inventor like Long working all the while on such pistons from 1913 until he testified in 1926 would not have any reliable, independent recollection that he made a particular piston in 1917 when there were no definite associations by which to fix this year. Entirely aside from the rule in interferences that there must be corroborated proof for conception and reduction to practice, it would have to be held that Long has failed to give any satisfactory testimony from which it can be concluded that he conceived count 1 prior to Gulick's filing date.

With respect to corroboration as to Long's conception of count 1 prior to November, 1917, it may be said that there is substantially nothing. The Long brief relies upon the testimony of the witnesses Cotter, Royalty, and Marks.

Royalty's testimony relates to the year 1918 and Marks's to the last part of 1917 or the forepart of 1918. This leaves for consideration the testimony of Cotter only.

Cotter testifies (Record, p. 94) that about 1917 Long had a piston similar to Exhibit 1 as nearly as he could remember but that Long made several changes and Cotter could not explain all of these changes. Cotter then attempts to describe the piston to the best of his recollection. In answer to Question 44 Cotter says that Long made so many different changes that he does not know that he could describe any more of the pistons that Long made.

It is entirely clear that Cotter, testifying about nine years after the event, was entirely truthful in admitting that he did not recall a definite piston. That Long had pistons during this interval is unquestionably true. But he has failed to prove that he had, at this early date, a piston satisfying count 1 of the interference.

With respect to count 2, which Long bases on his so-called "D" type, Long claims conception in 1916 and he identifies the piston, Exhibit 1, as having been made by him in that year. His answer to Question 53, (p. 22) is as follows:

> That particular piston I would say was made in the forepart of 1916, I made in the early part of 1916 several sets of this type.

Here, again, as in connection with count 1, Long is testifying as a matter of sheer memory and the unaided memory of a witness testifying ten years after the event

as to one of a large number of similar pistons is not sufficiently reliable. Long's answer already quoted, as well as his answer to Question 49 that "I would say" this piston was made sometime in 1916, indicates that Long is not deliberately falsifying but simply giving his vague impression as to what he had done ten years earlier.

There is no satisfactory corroboration of Long's claim for conception prior to Gulick's filing date. The witness Cotter when shown Exhibit 1 stated that it looked like a Long piston and that he made either it or one like it about 1916 (Q's. 42, 50, 51, Record, pp. 73-74). On cross-examination Cotter declines to swear that he personally made Exhibit 1 and that the date 1916 was given from unaided memory.

The witness Sanders had been a Chicago dealer in Franklin automobiles and he testifies that he met Long in the year 1914 at a time when Long had a machine shop in Quincy (Record, pp. 106-107). As it appears from Long's own testimony (pp. 40-41) that he had no interest in Quincy until 1917 it is manifest that the witness Sanders is mistaken in his date to the extent of three years. This illustrates very well the unreliability of memory for such long periods. The effort of Sanders to describe the piston that he saw was also partially unsuccessful (pp. 112-113).

The witness Stellman had been engineer for the H. H. Franklin Mfg. Co. and he testifies that a piston of similar design to Exhibit 1 was shown to him by Long in March, 1916 (Record, pp. 125-129). He also states in answer to Question 55 that Long brought or sent pistons to the Franklin Company from then on in varying quantities for test. The records of the Franklin Company, however, do not show any test prior to October, 1918. (See Gulick's Record, pp. 176-178, and Long's Record, pp. 300-312.) The witness Stellman testifies that he first saw the Long piston at the Chicago automobile show in 1916, but Stellman attended shows in other years (Record, p. 137) and he has no satisfactory way of fixing the 1916 show as the one at which he saw Long's piston. On cross examination in answer to XQ. 114 he stated that the piston which he saw in 1916 was not identical in construction with Exhibit 1.

The witness Royalty is an automobile mechanic who saw pistons in Long's place of business in 1916 and states that Exhibit 1 is like the sample which he saw at this time. (Q's. 40, 52, and 53, Record, pp. 144-146.) On cross examination he is somewhat more definite in stat-

ing in answer to XQ. 152 that the construction of Exhibit 1 is the same that he had seen in Long's place in Hannibal, Missouri, but that he would not say that he ever saw Exhibit 1 itself. As he stated in answer to Q. 39 (p. 176), it is pretty hard for anyone to remember exact details of construction, after several years. This testimony fails sufficiently to fix any specific year when he saw the piston like Exhibit 1.

The only other witness relied upon by Long as corroborating his prior conception of count 2 is the witness Wood and his testimony is much more indefinite than that of the other witnesses already discussed.

Long's entire case for priority of conception is in substance based upon the unaided memory of several witnesses speaking about ten years after the event and speaking then with the degree of uncertainty that is inevitable under such circumstances. Long had fifteen to twenty applications for split-skirt pistons on file at the time he was testifying, and had built a great many different forms for which no application was made. (Record, p. 42.) It was thought that no one after a period of many years would be able to recall the particular year when he saw a specific structure of any particular kind of piston from a large number of similar pistons unless there was some special facts that had impressed upon the mind of the witness this particular year and structure. The Long case for priority is fatally defective as to date and identity of the invention of count 2.

There are no facts upon which the examiner of interferences would rule that the Gulick application fails to disclose the inventions defined by the two counts. There is no adequate proof that Long had conceived the invention of either of these counts prior to Gulick's filing date. It is, therefore, held that Gulick is the first inventor of the subject matter of both counts.

Priority of invention of the subject matter in issue is hereby awarded to Edward J. Gulick, the senior party.

Limit of appeal: August 2, 1928.

H. I. Houston,
Examiner of Interferences.

July 2, 1928.

'PLAINTIFFS' EXHIBIT NO. 67-C.

Opinion of Board in Interference No. 49,569,

(Filed January 27, 1934.)

Appeal Nos. 252-253. REH
Hearing: May 3, 1929

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS

HARTOG v. LONG v. GULICK

Patent Interference No. 49,569 between the application of Stephen D. Hartog, filed Feb. 16, 1920, Serial No. 359,137; and applications of Elmer C. Long, filed Aug. 13, 1919, Serial No. 317,273; and Edward J. Gulick, filed Nov. 30, 1917, Serial No. 204,661. Pistons.

Messrs. Rippey & Kingsland for Hartog.
Messrs. Swan, Frye & Murray for Long.
Messrs. Evans & McCoy for Gulick.

This is an appeal from the decision of the Examiner of Interferences by the party Hartog and the party Long on the award of priority to the party Gulick.

The invention involved is defined by two counts as follows:

1. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

2. A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

The invention relates to a piston of the split skirt type in which there is yielding means between the head and sections of skirt of the piston and piston pin supports are carried by the yielding means.

The filing date of the party Gulick is November 30, 1917, and the party Hartog does not urge priority over this date but the party Long offers testimony which he urges proves conception prior to Gulick's filing date. Long submits no additional brief analyzing the decision of the Examiner of Interferences, and, while Long's counsel was present at the hearing, no specific oral argument was presented along this line. We have carefully considered the decision of the Examiner of Interferences on this point and concur in his decision in holding that the evidence offered did not show conclusively that Long had established a date of conception prior to Gulick's filing date.

It is urged by both Long and Hartog that Gulick is not entitled to make the count. It is contended that there was nothing in the original disclosure of the Gulick application which in any way referred to the means for supporting the skirt of the piston as being resilient. A careful discussion of Gulick's structure in relation to the application as originally filed has been made in our decision in interference No. 49,570 in which the same parties are involved and in which a decision is being rendered as of even date herewith. In that decision we reach the conclusion that although there is nothing in Gulick's application as originally filed that refers to resiliency, we consider that this feature is necessarily inherent in the structure as the support for the split skirt must be resilient in order to allow the piston to expand without expanding the skirt. We therefore concur in the decision of the law examiner referred to in the decision of the Examiner of Interferences that Gulick can make count

2. We also concur in the decision of the law examiner, as set forth in paper No. 39 of April 4, 1924, referred to in the decision of the Examiner of Interferences, that Gulick is entitled to make count 1.

We are urged to take note of certain patents which, it is contended, constitute anticipation but this matter is not before us for consideration and we do not deem it advisable to take it up of our own initiative, especially as these patents have been referred to in the records of these interferences for several years.

The decision of the Examiner of Interferences awarding priority of the subject-matter of the two counts to Edward J. Gulick is affirmed.

M. J. MOORE,
Assistant Commissioner,
G. R. IDE,
Examiner-in-Chief,
W. L. THURBER,
Examiner-in-Chief.
} BOARD OF APPEALS.

June 3, 1929.

PLAINTIFFS' EXHIBIT NO. 68-A.

Opinion of Examiner in Interference No. 49,575.

(Filed January 27, 1934.)

Hearing: Mar. 4, 1924. kse

IN THE UNITED STATES PATENT OFFICE.

DAY VS. TAYLOR VS. LONG VS. MAYNARD VS. GULICK.

PATENT INTERFERENCE No. 49,575.

MOTION TO DISSOLVE.

PISTONS.

Application of Ray E. Day filed Jan. 10, 1923, Ser. No. 611,698.
Application of George A. Taylor filed June 17, 1922, Ser. No. 569,104.
Application of Elmer C. Long filed Dec. 17, 1921, Ser. No. 522,974.
Application of Howard E. Maynard filed Jan. 5, 1921, Ser. No. 434,467.
Application of Edward J. Gulick filed Nov. 30, 1917, Ser. No. 204,661.

Mr. Clarence E. Mehlhope for Day.
Messrs. Macleod, Calver, Copeland & Dike for Taylor.
Mr. Herbert G. Fletcher for Long.
Mr. J. King Harness for Maynard.
Mr. Ray S. Gehr for Gulick.

The party Long moves to dissolve on the ground that the party Gulick is not entitled to make the count which is as follows:

> A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

It is practically conceded by the motion that Gulick can make all of the count upon his disclosure except the last clause, "said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion." It will not be necessary therefore to point out how the count reads upon Gulick's drawings in other respects. The skirt 11 has a split 21, clearly shown in Fig. 2, extending from top to bottom of the skirt on one side only of the pin bosses in Figs. 3 and 4. If the split permits free expansion and contraction of the skirt portion there is no need for argument to support Gulick's right to make the count.

Long argues that Gulick's piston is of rigid construction and Long's piston has a flexible structure. The Gulick specification describes a piston adapted to expand but not expand against the cylinder wall to such an extent as to stick, and it is split longitudinally so that it will not expand in circumference with a force great enough to cause the piston to stick. An expansion and contraction of the skirt portion is therefore permitted by the longitudinal slit. The rigidity of the webs 17, 18 with relation to the piston head is effected by the transverse stiffening ribs above the bosses 16 which may be seen in Figs. 1, 2, and 3 but on the side of the bosses 16 and below them there are no stiffening ribs. This is clear from Fig. 4.

The expansion and contraction mentioned in the count are due to thermal action, the head of the piston when in operation being highly heated. The effect of mechanical stresses is not taken into account. If the skirt 11 expands circumferentially when heated, as the specification states, the flanges or ribs 17 and 18 must allow such expansion and it is not material for the present purpose whether they move about one end or are slightly flexed laterally. The stated purpose of the longitudinal split being to prevent too great circumferential expansion, obviously some circumferential expansion takes place. *Free* expansion can not imply the absence of ribs connected to the skirt since Long has such ribs. If there is any difference of structure by reason of which Long's ribs 12, 13 permit expansion of the skirt and Gulick's ribs 17, 18 do not permit expansion of the skirt, the difference is not recited in the count.

Gulick discloses all the structural elements set forth in the count, and refers to the circumferential expansion

of the skirt, the split 21 preventing too great an expansion. This seems to be all that is necessary, and it is not important how Gulick may have described his device if as a matter of fact it has the requisite structure and function.

The motion is denied.

I. P. DENNEY,
Law Examiner.

Apr 4 1924.

PLAINTIFFS' EXHIBIT NO. 68-B.

Opinion of Board in Interference No. 49,575.

(Filed January 27, 1934.)

NLH

Hearing: June 20, 1924

Appeal No. 10,422. U. S. Patent Office. August 7, 1924.

Before the Examiners-in-Chief, on Appeal.

In the matter of the interference between the application of Elmer C. Long, filed December 17, 1921, Serial No. 522,974 and the application of Edward J. Gulick, filed November 30, 1917, Serial No. 204,661. Interference No. 49,575.

Pistons.

Mr. Herbert G. Fletcher for Long.
Mr. Ray S. Gehr for Gulick.

This is an appeal by Long from the decision of the examiner of interferences awarding priority of invention to the senior party Edward J. Gulick upon the record.

The issue is as follows:

> A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

The party Long moved to dissolve the interference on the ground that the party Gulick is not entitled to make the claim in issue. This motion having been denied by the law examiner the question of the right of Gulick to make the claim is now raised as the sole ground of this appeal, under the provisions of Rule 130.

It is admitted that the drawings of Gulick disclose all the structure specified in the count, the only contention being that his structure is such that it will not "permit free expansion and contraction of the skirt portion." The skirt is split at 21 and the specification states, page 3, line 21:

"In order that the skirt may not expand an undue amount when the piston is heated, as under operating conditions, it is split longitudinally as at 21."

The object of the split is to permit this expansion, the increased circumference being allowed for by the slot, instead of forcing the wall out radially against the cylinder as would be the case if the slot were absent. If the webs 17, 18 were so rigid that they would not yield laterally, the slot would have no function. Under the action of the heat, the circumferential expansion of the skirt would necessarily flex the webs 17 and 18 sufficiently to permit the expansion without substantial increase of the diameter of the skirt.

We have no doubt that Gulick can make the claim of the issue and the decision of the examiner of interferences is affirmed, priority of invention being awarded to Edward J. Gulick, the senior party.

FRANK C. SKINNER,
E. S. HENRY,
SIDNEY F. SMITH,
Examiners-in-Chief.

Limit of Appeal:
August 27, 1924.

PLAINTIFFS' EXHIBIT NO. 68-C.

Opinion of Court of Appeals of District of Columbia in Interference No. 49,575.

(Filed January 27, 1934.)

IN THE COURT OF APPEALS
OF THE DISTRICT OF COLUMBIA.

ELMER C. LONG,
Appellant,
vs.
EDWARD J. GULICK.
No. 1868.

Before Martin, Chief Justice; Robb and Van Orsdel; Associate Justices.

VAN ORSDEL, *Associate Justice.* This appeal is from the decision of the Commissioner of Patents in an interference proceeding in which priority of invention was awarded to the senior party Gulick.

The single count in issue reads as follows: "A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion."

The party Long moved to dissolve the interference on the ground that Gulick is not entitled to make the claim. The motion was denied by the Law Examiner, and his ruling was sustained on appeal by the Board of Examiners in Chief and by the Commissioner of Patents.

No testimony was taken in the case, and Long being the junior party, the only question to be reviewed is Gulick's right to make the claim.

The drawings of Gulick, we think, clearly disclose the structure of the count. It is contended, however, that his structure is not such as will "permit free expansion and contraction of the skirt portion." But the claim expressly covers this objection in the following language: "Said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion." We think it clear that the

object of the split is to permit of this expansion and, as held by the Board of Examiners, "under the action of the heat, the circumferential expansion of the skirt would necessarily flex the webs sufficiently to permit the expansion without substantial increase of the diameter of the skirt."

In this view of the case the right of Gulick to make the claim is beyond question. This point being settled, priority on the record goes to the party Gulick as a matter of course.

The decision of the Commissioner is affirmed.

JOSIAH A. VAN ORSDEL,
Associate Justice.

No. 1868 Patent Appeal. Elmer C. Long, Appellant, vs. Edward J. Gulick. Opinion of the Court per Mr. Justice Van Orsdel. Court of Appeals. District of Columbia. Filed February 7, 1927. Henry W. Hodges, Clerk.

A true Copy

Test: HENRY W. HODGES,
(Seal) *Clerk of the Court of Appeals of the District of Columbia.*

PLAINTIFFS' EXHIBIT NO. 69-A(1).

Opinion of Law Examiner in Interference No. 49,570.

(Filed January 27, 1934.)

Hearing: Mar. 3, 1924. kse

IN THE UNITED STATES PATENT OFFICE.

DAY vs. TAYLOR vs. LONG vs. MAYNARD vs. JARDINE vs. HARTOG vs. GULICK.

PATENT INTERFERENCE No. 49,570.

MOTION TO DISSOLVE.

PISTONS.

Application of Ray E. Day filed Jan. 10, 1923, Ser. No. 611,698.
Application of George A. Taylor filed June 17, 1922, Ser. No. 569,104.
Application of Elmer C. Long filed Dec. 17, 1921, Ser. No. 522,974.
Application of Howard E. Maynard filed Jan. 3, 1921, Ser. No. 434,467.
Application of Frank Jardine filed March 9, 1921, Ser. No. 450,898, renewal of application filed March 11, 1920, Ser. No. 364,997.
Application of Stephen D. Hartog filed Feb. 16, 1920, Ser. No. 359,137.
Application of Edward J. Gulick filed Nov. 30, 1917, Ser. No. 204,661.

Mr. Clarence E. Mehlhope for Day.
Messrs. Macleod, Calver, Copeland & Dike for Taylor.
Mr. Herbert G. Fletcher for Long.
Messrs. Whittemore, Hulbert & Whittemore and Mr. J. King Harness for Maynard.
Messrs. Richey, Slough & Watts for Jardine.
Messrs. Rippey & Kingsland for Hartog.
Mr. Ray S. Gehr for Gulick.

The party Hartog moves to dissolve on the ground that the party Gulick has no right to make the claim because Gulick does not disclose the essential element

"internal yielding ribs supporting the head and body." The count is as follows:

> A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

At the hearing the party Gulick offered certain affidavits in support of Gulick's right to make the count and to traverse references cited in other motions in related interferences. The party Hartog objected to the affidavits on the ground that they were inadmissible because they were expert opinion affidavits and were not filed at least five days prior to the hearing. The objection was sustained in view of the decision in *Horton v. Leonard*, C. D., 1910-81, without prejudice to the filing of proper affidavits in other related interferences restricted to consideration of the references. Since the interference is one of a series in which numerous motions are to be heard, involving the same references, the party Hartog will have ample time to consider the unobjectionable part of the affidavits before the termination of the discussion so that objection to the admissible part of the affidavits because of insufficient notice becomes technical.

The head of the Gulick piston is part 10, the body is skirt 11, the internal ribs supporting the head and body are ribs 17, 18 with extensions 20, and the means on the ribs adapted to form engaging connection with operable parts for said piston is the bosses 16 which receive the wrist pins of the connecting rod.

It will be apparent that the question for decision is whether or not the ribs 17, 18, 20 are yielding. The extent and character of the yielding, or any definite construction or configuration of the rib by which it is made to yield are not expressly stated in the count. There are several forces at work upon the ribs when the piston is in operation resulting from a thermal expansion due to heat transmitted from the intensely heated surface of the piston head, and mechanical stresses during compression or explosion of the gas. The material used in most cases is a light aluminum alloy having a much larger coefficient of expansion than cast iron and ordinarily requiring a greater initial clearance between piston and cylinder than cast iron. The head expands radially to a greater extent than the skirt, and the ribs would presumably expand more than the skirt because heat is transmitted

directly to the ribs and the skirt is separated from the head by the annular opening 12. If Gulick's ribs are yielding on account of thermal action thereon, it will be unnecessary to consider if they are yielding in response to mechanical stresses. The skirt 11 expands circumferentially under the influence of heat, and the slit 21 is provided to prevent too great expansion. The upper parts of the ribs are stiffened by transverse flanges between the piston head and the pin bosses but the lower parts are free from stiffening flanges and directly connect the pin bosses to the skirt by relatively narrow rib portions as shown in Fig. 1. If the skirt and the ribs expanded uniformly so that elongation of a rib would be accompanied by a corresponding circumferential elongation of the skirt, the rib and the skirt moving together to the same extent, there might not be any substantial lateral flexure or yielding of the rib but it is not seen how they can expand uniformly or how some lateral flexure or yielding of the rib 18 between the boss and the skirt can be avoided. The yielding need not be great or due to any special structure of the rib to support the count. Nor is it necessary that the entire rib should yield. If it yields at all for any purpose or for any reason, it would come within the scope of the count. It can not be conceded that the purpose of slot 21 in Gulick's skirt is defeated by alleged rigidity of the lower parts of the ribs, and Gulick is obviously not alone in stiffening the parts of the ribs above the pin bosses. Hartog's rib structure is no where mentioned in the count and can not be read into the count by any accepted rule of interpretation. *Scott vs. Longtin*, C.D., 1922-145. The intended scope of the count is obvious from the different specific disclosures in the respective applications of the several parties.

The motion is denied.

I. P. Disney,

Apr 4 1924 *Law Examiner.*

PLAINTIFFS' EXHIBIT NO. 69-A(2).

Opinion of Examiner of Interferences in Interference No. 49,570.

(Filed January 27, 1934.)

Final Hearing: March 23, 1928. ES/HMH

IN THE UNITED STATES PATENT OFFICE.

PATENT INTERFERENCE No. 49,570.

LONG v. HARTOG v. GULICK.

PISTONS.

Application of Elmer C. Long filed December 17, 1921, No. 522,974.
Application of Stephen D. Hartog filed February 16, 1920, No. 359,137.
Application of Edward J. Gulick filed November 30, 1917, No. 204,661.

Messrs. Swan, Frye & Murray for Long.
Messrs. Rippey & Kingsland for Hartog.
Mr. Ray S. Gehr for Gulick.

The invention involved is defined in a single count as follows:

> 1. A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

The party Hartog claims no date earlier than Gulick's filing date. As between Hartog and Gulick, the sole question is whether the Gulick application as filed disclosed the invention defined by the count. And with respect to the count, the controversy centers entirely around the word "yielding." Hartog's motion to dissolve was denied by the law examiner in an opinion of April 4, 1924. The law examiner ruled that the ribs 17, 18 and 20, shown in Hartog's application as filed, would at least be yieldable in response to thermal action and that this would satisfy the requirement of the count. He further ruled that when the skirt 11 expands uniformly

with the ribs there will be an elongation of the ribs corresponding to the circumferential elongation of the skirt. He therefore denied Hartog's motion to dissolve, and held that Gulick disclosed the invention in his application as filed.

It is recognized that Gulick did not mention in his original application any yieldability of the ribs or in any way indicate recognition of this feature until years after the filing of his application. Hartog also urges that subsequent to the decision of the law examiner there was a ruling by the Examiners-in-Chief and by the Commissioner in another interference, *Jardine v. Hartog*, No. 49,578, that should control the interpretation of the count in the present interference. It is thought, however, that this ruling with respect to different disclosures, while significant and guiding, is not so clearly decisive as to justify the interference examiner in deciding that the ruling of the law examiner was erroneous (Rule 130).

Hartog has taken testimony directed to proving that his invention date is earlier than Long's, but he has not taken any to prove that the Gulick original disclosure did not include the invention of this count. On the other hand, Gulick has presented the testimony of the witnesses Gruenfeldt and Linney, directed to showing that a piston closely similar to the Gulick application disclosure is operative. From this operativeness Gulick argues that there must be a slight lateral flexing or yielding of the ribs. Whether this conclusion necessarily follows need not be decided. At least Hartog has presented no testimony on the subject.

It is noted also that the Court of Appeals of the District of Columbia has ruled in the case of *Long v. Gulick*, 360 O. G. 262; 1927 C. D. 134; 17 Fed. (2d) 686, that the webs of the Gulick application involved in the present interference are necessarily flexed under the action of heat.

Upon the whole case there does not appear to be any sufficient reason for the interference examiner to arrive at a conclusion contrary to the decision made by the law examiner with respect to Gulick's right to make the count.

There remains for consideration the question of priority as between Long and Gulick. Gulick's application was filed November 30, 1917, and Gulick presents testimony directed to showing that he made the invention earlier than this date. It is not found, however, that

Long has established that he had conceived the invention at any time prior to Gulick's filing date. The Long brief places reliance upon a piston which Long designates as the "G" type. This "G" type piston is illustrated by the Long Exhibit X-1 and Long testifies in answer to question 52, page 188, that this piston was made in the early part of 1917. He admits on cross-examination (XQs. 120-123; p. 198) that he gives this date of 1917 upon the basis of unaided memory. The testimony of a person speaking in 1926 as to what he had done in 1917 would be of little weight unless there was some way for establishing the time. This is particularly true in the present case because, as Long tells in answer to cross-question 149, he was constantly experimenting on all types of pistons that he could think about, and under these circumstances it is not reasonable to believe that he could definitely determine that one particular piston was made in one particular year when he had nothing to aid him in fixing this year.

Even if Long's testimony itself were much stronger than it is, it would not be sufficient without corroboration, and Long has no corroboration with respect to Exhibit X-1 for any date earlier than 1918. The witness Royalty thinks that he saw Exhibit X-1 at Quincy, Illinois, in 1918, but he is not positive (Qs. 53-58; pp. 177-178); the witness Wood testifies to a date in 1918 or 1919; he says that the piston he saw had some kind of a metal rod in it but he did not pay much attention to that (Q. 121; p. 245).

It is found that Long has not established that he had conceived the invention prior to Gulick's filing date and that the Gulick application as filed disclosed the invention in issue. Hartog claims no date earlier than Gulick's filing date.

Priority of invention of the subject matter in issue is awarded to Edward J. Gulick, the senior party.

Limit of appeal: August 2, 1928.

H. I. Houston,
Examiner of Interferences.

July 2, 1928.

PLAINTIFFS' EXHIBIT NO. 69-B(1).

Petition for Rehearing in Interference No. 49,570.

(Filed January 27, 1934.)

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS.

ELMER C. LONG, v. STEPHEN D. HARTOG, v. EDWARD J. GULICK,	INTERFERENCE No. 49,570.

PETITION FOR REHEARING.

Comes now the party Hartog in the above entitled interference and moves for a rehearing of the decision of the Board of Appeals, dated June 3, 1929, and, for ground of the petition, shows to the Honorable Board the following:

1. That the Board misconstrued the disclosure of the Gulick application and, therefore, erred in its finding that—

> "If the piston expands and the skirt does not we consider that the support for the skirt must necessarily be resilient and that this is an inherent quality of all pistons of this general nature."

2. That the Board erred, even on the assumption that the internal ribs of the Gulick structure were yielding, in permitting Gulick to predicate invention upon the characteristic of the ribs which the Board has found was not disclosed in the application as originally filed by Gulick.

3. That the Board has misconstrued the invention covered by the count of this interference, and has placed a construction on the count out of harmony with the Hartog application (in which the count originated) in which the ribs were shown of a structure (springlike in character) that was yielding, and were thus differentiated from the art.

4. That because of the construction given to the count this Board has held the count to be nothing more than was in the prior art and particularly in United States patent to Ebbs, No. 700,309, dated May 20, 1902, and United States patent to Van Bever, No. 1,031,212, dated July 2, 1912, in which the skirt was split and supported by an internal structure and in which, like the Gulick structure, the piston contracts by the flexibility of the skirt, and not by the inherent or actual resiliency or yieldability of the *internal* support.

WHEREFORE the party Hartog prays for a rehearing to the end that the errors in the decision of this Honorable Board may be corrected in order that justice may be done in the premises.

Respectfully submitted,

.....,

Attorneys for Hartog.

St. Louis, Missouri,
June 13, 1929.

PLAINTIFFS' EXHIBIT NO. 69-B(2).

Opinion of the Board in Interference No. 49,570.

(Filed January 27, 1934.)

Appeal Nos. 254-255. REH

IN THE UNITED STATES PATENT OFFICE

Before the Board of Appeals

Long v. Hartog v. Gulick

Patent Interference No. 49,570 between the application of Elmer C. Long, filed Dec. 17, 1921, Serial No. 522,974, and applications of Stephen D. Hartog, filed Feb. 16, 1920, Serial No. 359,137, and Edward J. Gulick, filed Nov. 30, 1917, Serial No. 204,661. Pistons.

Messrs. Swan, Frye & Murray for Long.
Messrs. Rippey & Kingsland for Hartog.
Messrs. Evans & McCoy for Gulick.

Petition for Rehearing.

The party Hartog has petitioned for rehearing from the decision of the Board of Appeals of June 3, 1929, affirming the decision of the Examiner of Interferences in awarding subject-matter of the count to the party Gulick.

Several allegations of error are set forth but they may be summed up by the statement that the party Hartog urges that we were in error in holding that the party Gulick had a right to make the count because the support for the piston skirt must necessarily be resilient. We have given careful consideration to the memorandum offered in support of the petition but it is unnecessary to discuss this in detail. All the matters referred to therein were before us at the time our decision was rendered and were carefully considered. The point upon which the reconsideration is asked is probably the most important one in the entire series of interferences in which the petitioner is involved. The point has been repeatedly considered in one form or another by tribunals of this office and also in one instance by the Court. We

reviewed the entire record and carefully considered the arguments presented. As a result of this investigation our judgment was deliberately made and we find no reasons presented in this petition which influence us to reach any other conclusion.

The petition for rehearing is therefore denied.

M. J. MOORE,
Assistant Commissioner,
G. R. IDE,
Examiner-in-Chief,
W. L. THURBER,
Examiner-in-Chief,
} BOARD OF APPEALS.

July 1, 1929.

PLAINTIFFS' EXHIBIT NO. 69-B(3).

Opinion of the Board of Appeals in Interference No. 49,570.

(Filed January 27, 1934.)

Appeal Nos. 254-255. REH

Hearing: May 3, 1929

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS.

LONG v. HARTOG v. GULICK.

Patent Interference No. 49,570 between the application of Elmer C. Long, filed Dec. 17, 1921, Serial No. 522, 974; and applications of Stephen D. Hartog, filed Feb. 16, 1920, Serial No. 359,137; and Edward J. Gulick, filed Nov. 30, 1917, Serial No. 204,661. Pistons.

Messrs. Swan, Frye & Murray for Long;
Messrs. Rippey & Kingsland for Hartog;
Messrs. Evans & McCoy for Gulick.

This is an appeal from the decision of the Examiner of Interferences by the party Long and the party Hartog on the award of priority to the party Gulick.

The invention involved is defined by a single count as follows:

> 1. A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

The invention relates to a piston of the split skirt type in which there is yielding means between the head and skirt of the piston and piston pin supports are carried by the yielding means.

The filing date of the party Gulick is November 30, 1917 and the party Hartog does not urge priority over this date, but the party Long offers testimony which he urges proves conception prior to Gulick's filing date. Long submits no additional brief analyzing the decision of the Examiner of Interferences, and, while Long's

counsel was present at the hearing, no specific oral argument was presented along this line. We have carefully considered the decision of the Examiner of Interferences on this point and concur in his decision in holding that the evidence offered did not show conclusively that Long had established a date of conception prior to Gulick's filing date.

It is urged by both Long and Hartog that Gulick is not entitled to make the count. It is contended that there was nothing in the original disclosure of the Gulick application which in any way referred to the means for supporting the skirt of the piston as being resilient. We have examined this application and we fail to find anything therein as originally filed that in any manner refers to the use of such a term. In the brief of Hartog, (page 74), we find the following language:

> "Under all of the testimony and under the findings of the Patent Office in Interference No. 49,578, Jardine v. Hartog, the ribs do not and cannot yield in the Long structure and they do not and cannot yield in the Gulick structure. This being true, Long as well as Gulick had no right to make count 2 of the present interference, and upon this ground, Hartog must be awarded priority of invention over both Long and Gulick.
>
> This feature is the crux of the whole question where yieldability of the internal ribs is made a feature of the counts.
>
> It is the most important point in the whole series of interferences.
>
> Hartog is so firmly convinced that he is right on this proposition, that he urges and insists that this question must be examined and that this tribunal, bound as it is by the decisions of the Patent Office * * *."

We agree with Hartog that this feature is of greatest importance in the group of interferences that are before us, and in this connection we call attention to the fact that the interferences in which we are rendering decisions of even date herewith, and which were argued at the same time with the counsels for all the parties present are:

49,569, 49,570, 49,571, and 49,579.

We shall have occasion to refer to this decision in the other decisions, and the ruling which we make here in

regard to the question of resiliency of the supporting member for the piston skirt is intended to be applicable to all the cases, even including the pistons regarding which testimony has been offered for establishing early conception.

In Gulick's brief (page 78), we find reference to the same question but in which a different set of decisions is relied upon and which terminate in the decision of the Court of Appeals of the District of Columbia. It is contended by the party Hartog that we should follow the decision in the Jardine v. Hartog interference, No. 49,578, which he holds is favorable to his case. Gulick urges that we should follow the decision in the interference No. 49,575 in which Long raised the same question against Gulick. Gulick contends that we must be bound by the decision of the Court.

We consider that neither party is right in taking his respective position. In interference No. 49,578 neither Long nor Gulick were parties. In interference No. 49,575 Hartog was not a party to the appeal. Of course careful consideration should be given to prior decisions of the same tribunal and great weight should be given to decisions of superior tribunals, but where the parties are different, it is the duty of those rendering a decision to consider each particular case on its own merits.

As previously stated, we find nothing in Gulick's file in regard to the question of resiliency. It is perfectly clear, however, that when the piston skirt was split it was for the purpose of allowing it to yield when the heat caused the piston to expand. If the piston expands and the skirt does not we consider that the support for the skirt must necessarily be resilient and that this is an inherent quality of all pistons of this general nature. We therefore concur in the opinion of the law examiner as referred to in the opinion of the Examiner of Interferences that Gulick has a right to make the count.

Reference has also been made in the brief to the interference of Hartog v. Pomeroy, No. 45,351, but for reasons discussed in connection with the other interferences to which our attention has been called, we hold that the ruling in that interference is not binding upon us in this appeal.

Hartog raises the question of estoppel and refers to prior interferences in which he contends the same parties in interest were involved. We fail to find any proof to substantiate this contention.

The decision of the Examiner of Interferences awarding priority of the subject-matter of the count to Edward J. Gulick is affirmed.

M. J. MOORE,
Assistant Commissioner
G. R. IDE,
Examiner-in-Chief
W. L. THURBER
Examiner-in-Chief

BOARD OF APPEALS.

June 3, 1929.

PLAINTIFFS' EXHIBIT NO. 69-C.

Opinion of Court of Customs and Patent Appeals in Interference No. 49,570.

(Filed January 27, 1934.)

UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

STEPHEN D. HARTOG,
Appellant,

v.

ELMER C. LONG and
EDWARD J. GULICK,
Appellees.

October term, 1930,
Patent Appeal No. 2609,
Patent Calendar No. 105,
Interference No. 49,570.

BLAND, *Judge.*

This appeal is from a decision of the Board of Appeals in the Patent Office awarding priority of invention in a single count to Edward J. Gulick in which the appellant and Elmer C. Long were parties. From the decision of the Board Hartog appealed here and Long did not.

The count in issue, which was taken from the Hartog application, is as follows:

> 1. A piston comprising a head and body, *internal yielding ribs supporting the head and body,* and means on said ribs adapted to form engaging connection with operable parts for said piston. [Italics appellant's]

The issue in this case involves the same invention and the same applications and substantially the same question as was involved in *Hartog v. Long and Gulick,* Patent Appeal No. 2608, Interference No. 49,569, decided concurrently herewith, and we follow the reasoning of that case in the decision of this one.

The invention relates to an automobile piston, the apron of which is made flexible or resilient in order that it may yield from the pressure occasioned by expansion due to heat. The details of the disclosures need not be repeated here.

This interference originally was between several different parties and progressed in the Patent Office concur-

rently with *Hartog v. Long and Gulick,* Interference No. 49,569, *supra.*

There are but two questions presented: First, had Gulick the right to make the count? Second, is Gulick estopped from making the count of this interference by reason of the decision in *Hartog v. Pomeroy,* Interference No. 45,351.

The first question is, as found by the board, "the most important point in the whole series of interferences." In determining whether Gulick had the right to make the count the crux of the whole question is the yieldable feature of the ribs of the two disclosures. In the instant case we think Gulick's disclosure meets the requirement of the claim in the phrase "internal yielding ribs supporting the head and body" for the same reasons that we concluded that his disclosure met the requirements of the phrase "being resiliently yieldable" in the count of the interference No. 49,569, *supra.* We approve the finding of the Board of Appeals which is expressed in the following language:

> As previously stated, we find nothing in Gulick's file in regard to the question of resiliency. It is perfectly clear, however, that when the piston skirt was split it was for the purpose of allowing it to yield when the heat caused the piston to expand. If the piston expands and the skirt does not we consider that the support for the skirt must necessarily be resilient and that this is an inherent quality of all pistons of this general nature. We therefore concur in the opinion of the law examiner as referred to in the opinion of the Examiner of Interferences that Gulick has a right to make the count.

The case of *Long v. Gulick,* 17 F. (2d) 686, 57 Appls. D. C. 98, decided by the Court of Appeals of the District of Columbia and referred to by this court in *Hartog v. Long & Gulick,* Interference No. 49,569, *supra,* passed upon an issue almost identical with the issue presented here by the first question raised.

As to the second question presented we also agree with the finding of the board which is expressed in the following language:

> Reference has also been made in the brief to the interference of *Hartog v. Pomeroy,* No. 45,351, but for reasons discussed in connection with the other

interferences to which our attention has been called, we hold that the ruling in that interference is not binding upon us in this appeal. Hartog raises the question of estoppel and refers to prior interferences in which he contends the same parties in interest were involved. We fail to find any proof to substantiate this contention.

Hartog suggests that Gulick cannot make the claim for the reason that he is barred from doing so by reason of the doctrine of equitable estoppel, arising from the fact that there was a community of interest or ownership of the subject matter of the interference in *Hartog v. Pomeroy, supra,* and the subject matter of the interference in the instant case. We find nothing in the record to justify the conclusion that such a community of interest exists as is suggested by appellant.

The Board of Appeals properly awarded priority of invention in the subject matter of the count involved in this interference to Gulick over Long and Hartog and affirmatively found that:

> We have carefully considered the decision of the Examiner of Interferences on this point and concur in his decision in holding that the evidence offered did not show conclusively that Long had established a date of conception prior to Gulick's filing date.

The decision of the Board of Appeals, awarding priority of invention to Gulick, is affirmed.

AFFIRMED.

PLAINTIFFS' EXHIBIT NO. 70-A.

Opinion of the Examiner in Interference No. 49,571.

(Filed January 27, 1934.)

Final Hearing: March 23, 1928. ES/LAW

IN THE UNITED STATES PATENT OFFICE.

PATENT INTERFERENCE No. 49571.

LONG v. GULICK.

PISTONS.

Patent granted Elmer C. Long November 1, 1921, No. 1,395,441, on an application filed December 9, 1918, No. 265,947. Applications Nos. 317,273, filed August 13, 1919; 339,892, filed November 22, 1919.

Messrs. Swan, Frye & Murray for Long.
Mr. Ray S. Gehr for Gulick.

The interference is defined in four counts as follows:

1. A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion and separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being cooperably connected at their opposite ends to said cylinder engaging portion.

2. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.

3. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from

the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

4. A one piece piston provided with a solid end portion and a skirt portion, said skirt portion having a longitudinally extending slot formed through the thickness of its wall, said slot extending from the rear edge of the skirt portion and forming adjacent disconnected portions in said skirt portion which are capable of being moved inwardly or outwardly without restraint.

The subject matter in controversy between Gulick and Long is a piston for combustion engines so constructed as to be suitable for material like aluminum having a high coefficient of expansion. This attribute of aluminum and its alloys causes pistons made therefrom to expand greatly when heated, so that an ordinary trunk piston is either too loose when cold or when hot it seizes the cylinder walls.

In support of his case for priority with respect to count 1, Long relies upon what he calls his "G" type piston. It is ruled in companion interference No. 49,570, decided simultaneously herewith, that Long has failed to establish conception of the "G" type piston prior to Gulick's filing date. The Gulick application involved in the companion interference is likewise involved in the present interference. The testimony relied upon by Long in the present interference for the "G" type piston consists of the deposition of Long himself (pp. 65-92); that of Royalty (pp. 46-64); and that of Wood (pp. 145-169). The deposition of Long is printed in the record of the companion interference on pages 181-208; that of Royalty on pages 162-170; and that of Wood on pages 230-254. The testimony being the same, and the embodiment relied upon being the same, it is ruled, for the reasons set forth more fully in the decision rendered in companion interference 49,570, that Long has not proved conception of his Exhibit "G" piston prior to Gulick's filing date.

Long relies upon what he calls his Type "F" piston for priority as to counts 2 and 3. It is ruled in companion interference No. 49,569, decided simultaneously herewith, that Long has failed to establish conception of the "F" type piston prior to Gulick's filing date. The Gulick application involved in the companion interference is likewise involved in the present interference. The testimony relied upon by Long in the present interference for the "F" type piston consists of the deposition of Long himself (pp. 124-144); that of Cotter (pp. 13-32); that of Royalty (pp. 46-64); and that of Marks (pp. 213-220). The deposition of Long is the same as that in the said companion interference, there printed on pages 209-229. The Royalty deposition is printed in the other record at pages 162-170. The Marks deposition is printed in the other record at pages 300-307. The testimony being the same, and the embodiment relied upon being the same, it is ruled, for the reasons set forth more fully in the decision rendered in companion interference 49,569, that Long has not proved conception of his Exhibit "F" piston prior to Gulick's filing date.

With respect to count 4, Long relies for priority upon what he calls his "B" type piston. As to this count Long is involved on his patent No. 1,395,441, the count being claim 10 thereof. This patent illustrates a piston having a "T" shaped slot in the skirt, best shown on Figure 2 of the patent drawing. The count, however, does not expressly require the horizontal element of the "T" shaped slot and it is assumed for the purpose of this decision that Long may establish priority by a piston having merely a longitudinally extending slot from the rear edge of the skirt portion, thus forming adjacent disconnected portions in the skirt capable of being moved inwardly and outwardly without restraint. There is testimony by Long himself that he made such pistons in the summer of 1913 and used them in the car on which he made a trip from Hannibal, Missouri, to St. Louis, Missouri and back (Record, pages 97-101). In answer to Q. 8 Long asserts that he was in Hannibal from 1906 until 1913, but he remained there until 1917 (Q. 4; p. 65). His presence at Hannibal, therefore, does not fix the year 1913. The pistons operated satisfactorily on this trip to St. Louis, but the motor was torn down and abandoned, the pistons being sold as scrap.

Long was assisted in sawing the slots for these pistons by the witness Cotter and this witness corroborates

Long as to the construction and installation of these pistons (Record, pp. 23-27).

The weakness of the testimony by Long and Cotter is that neither of them has any way of establishing the year 1913. They testified in 1925, twelve years after the supposed test of these pistons. Long worked on a great many other pistons as appears from the record. His memory as to the particular year in which he tested a particular piston some twelve years prior to the time of testifying is not reliable, and the same must be said of the corroborating witness Cotter. There is no contemporary evidence of any character either physical or documentary.

Gulick testifies that pistons similar to his Exhibit 8 were successfully tried out in a Renault car in 1911. This Exhibit 8 piston includes both longitudinal and a horizontal slots. The motor was the property of the Excelsior Motor and Manufacturing Company, of Chicago, and according to Gulick's testimony he drove this Renault car to some road races at Elgin, Illinois, in August, 1911, and the pistons remained in the car until October, 1911.

For Gulick's testimony there is the corroboration of the witness Williamson that he made this trip with Gulick, but Williamson did not see the pistons. The witness Engle describes, in answer to Q. 20, record page 167, his work in sawing the longitudinal slot in the pistons, and he recognizes Exhibit 8 as looking like those which he put into Gulick's motor. He accompanied Gulick on the trip to the Elgin road races and the pistons operated satisfactorily, but some months later the top broke from one of the pistons. The witness Engle is somewhat hazy in fixing the date of these events, but the fact that he left the employment of the Excelsior company near the end of the year 1911 helps him to fix the date.

Gulick's case for the 1911 date, like Long's case for the 1913 date, is defective for lack of contemporaneous evidence, but it is superior to the Long case in that there is a somewhat better fixing of the time. The fact that both parties failed to push their inventions to commercial use or patent application casts doubt upon the success of the trials, as does the fact that both of them shortly junked the pistons. If it should be ruled that Gulick had no actual reduction to practice in 1911, it would follow also that Long had no actual reduction to practice in 1913. The evidence for Gulick is at least suf-

ficient to establish priority of conception, and if both parties be restricted in their respective early dates of 1911 and 1913 to conception, then Gulick is the first to reduce to practice upon the basis of the pistons similar to his drawing Exhibit 11 which were successfully tried out in a Buda car in the year 1914. That Gulick had a slotted or slit piston when he was associated with Amplex Motor Co. in 1914-1915 is testified to by Hoadley, who installed them, although he testifies to a slot down the center, and a groove below the lower ring (Record, pp. 110-111); he says the sketch, Exhibit 11, looks like the pistons, but this sketch is itself of much later date (Record, pp. 64-65). The testimony of Randall (Record, pp. 152-155) and the stipulated testimony of Duck (pp. 175-176) is stronger and shows that the pistons were successfully used in driving a car with a Buda motor. The date is fixed by the fact that the company went into receivership in November, 1914, and Duck left the company in the spring of 1915. The identify of the invention is primarily dependent upon the recollection of the witnesses.

While the matter is not entirely free from doubt, the burden of establishing priority was upon Long, and it is believed that Gulick has sufficiently proved actual reduction to practice in 1914. But even if Gulick were restricted to his 1917 filing date for reduction to practice he would still be first to reduce to practice. Long has no proofs of actual reduction to practice prior to Gulick's filing date, any better than Gulick's 1914 proofs.

It is held that Gulick is the prior inventor of the subject matter of count 4 being the first to conceive and having probably reduced to practice prior to Long's conception date. In any event, Gulick reduced to practice prior to reduction to practice by Long and would, therefore, be entitled to an award of priority on the ground that he was the first to conceive and the first to reduce to practice.

Priority of invention of the subject matter of the four counts in issue is awarded to Edward J. Gulick, the senior party.

Limit of appeal: August 2, 1928.

H. I. Houston,
Examiner of Interferences.

July 2, 1928.

PLAINTIFFS' EXHIBIT NO. 70-B.

Opinion of the Board in Interference No. 49,571.

(Filed January 27, 1934.)

Appeal No. 256. REH

Hearing: May 3, 1929

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS

LONG v. GULICK

Patent interference No. 49,571 between the application of Elmer C. Long, filed Nov. 22, 1919, Serial No. 339,892; and application of Edward J. Gulick, filed Nov. 30, 1917, Serial No. 204,661. Pistons.

Messrs. Swan, Frye & Murray for Long.
Messrs. Evans & McCoy for Gulick.

This is an appeal from the decision of the Examiner of Interferences by the party Long on the award of priority to the party Gulick.

The invention involved is defined by four counts as follows:

1. A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion and separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being cooperably connected at their opposite ends to said cylinder engaging portion.

2. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.

3. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges

in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

4. A one piece piston provided with a solid end portion and a skirt portion, said skirt portion having a longitudinally extending slot formed through the thickness of its wall, said slot extending from the rear edge of the skirt portion and forming adjacent disconnected portions in said skirt portion which are capable of being moved inwardly or outwardly without restraint.

The invention relates to a piston of the split skirt type in which there is yielding means between the head and sections of skirt of the piston and piston pin supports are carried by the yielding means.

The filing date of the party Gulick is Nov. 30, 1917. The party Long offers testimony which he urges proves conception prior to Gulick's filing date. Long submits no additional brief analyzing the decision of the Examiner of Interferences, and, while Long's counsel was present at the hearing, no specific oral argument was presented along this line. We have carefully considered the decision of the Examiner of Interferences on this point and concur in his decision in holding that the evidence offered did not show conclusively that Long had established a date of conception prior to Gulick's filing date. We also concur in the opinion of the Examiner of Interferences that Gulick proved reduction to practice in 1914.

The decision of the Examiner of Interferences is affirmed awarding priority to Edward J. Gulick on the four counts.

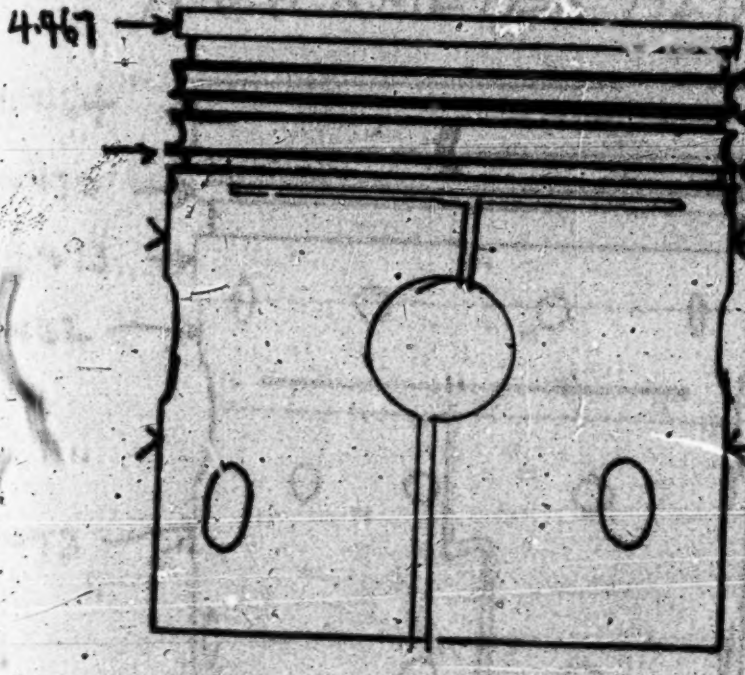
M. J. MOORE,
Assistant Commissioner
G. R. IDE,
Examiner-in-Chief
W. L. THURBER,
Examiner-in-Chief

BOARD OF APPEALS.

June 3, 1929.

157B

MONCKMEIER CAST IRON PISTON



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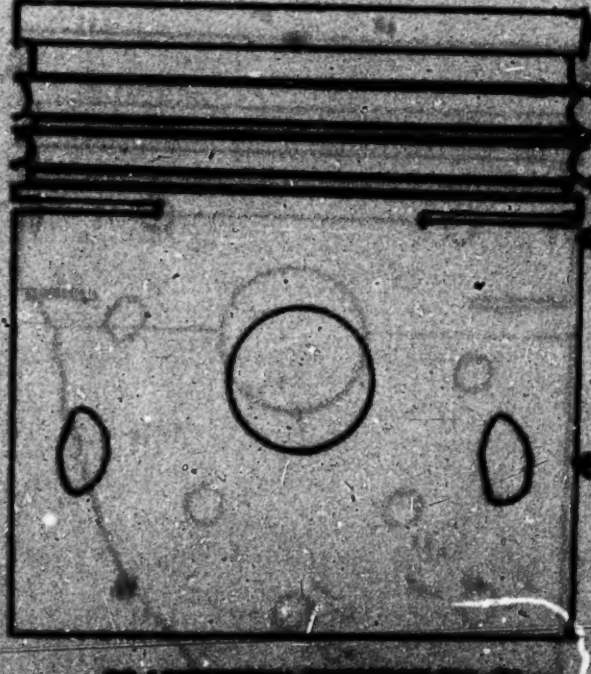

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(Filed January 27, 1934.)

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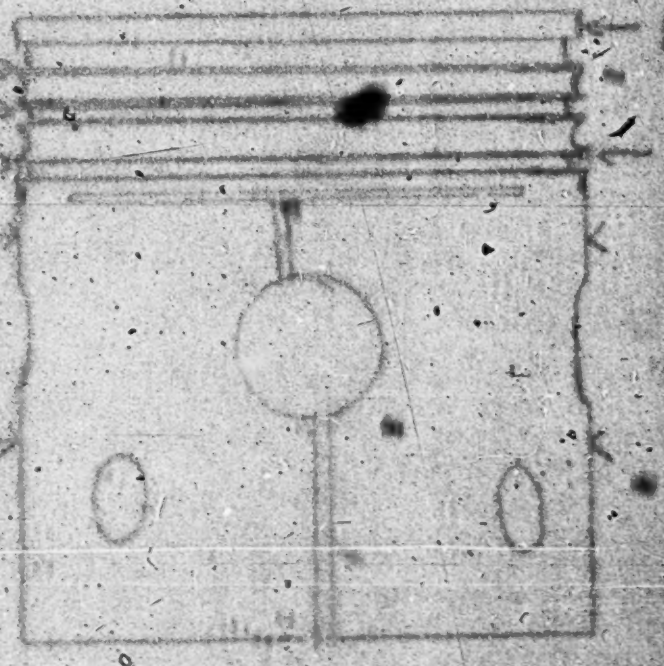

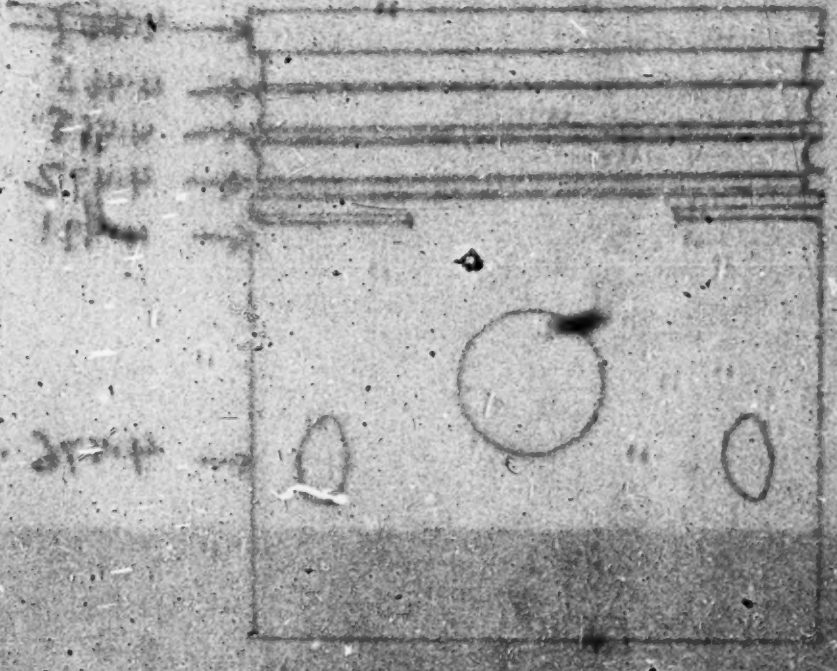

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NONCKMEIER ALUMINUM

PISTON
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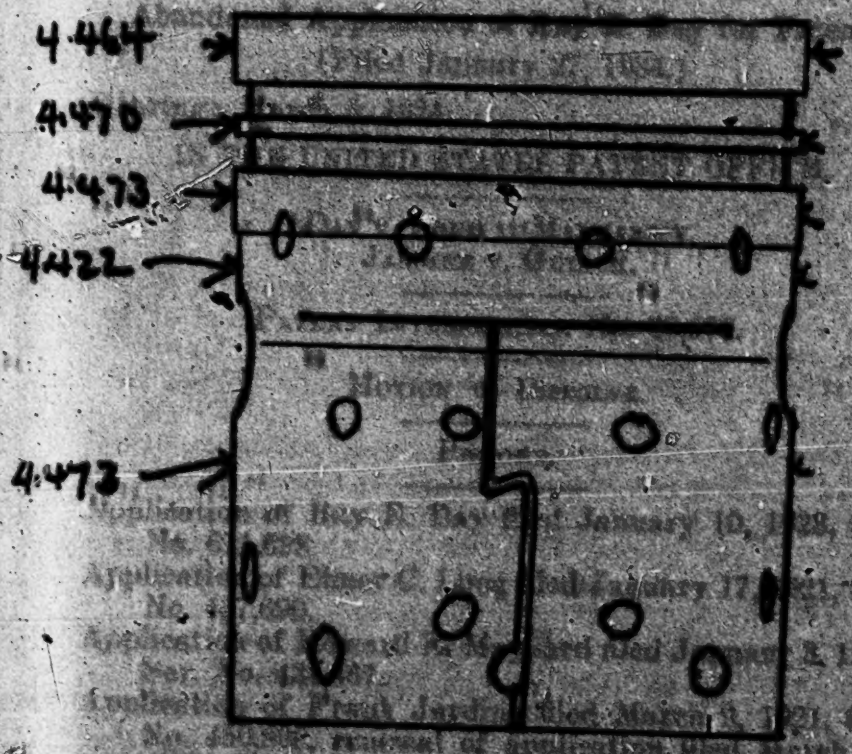

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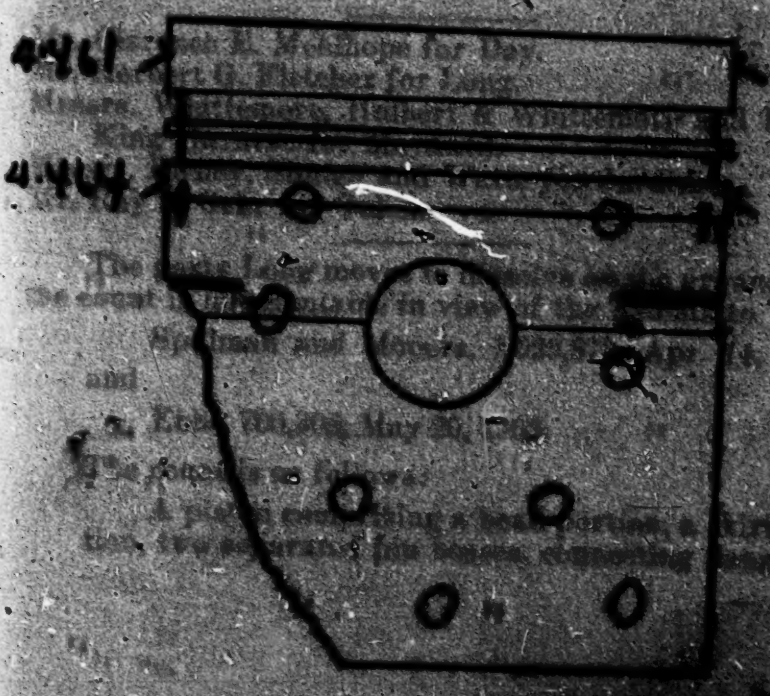

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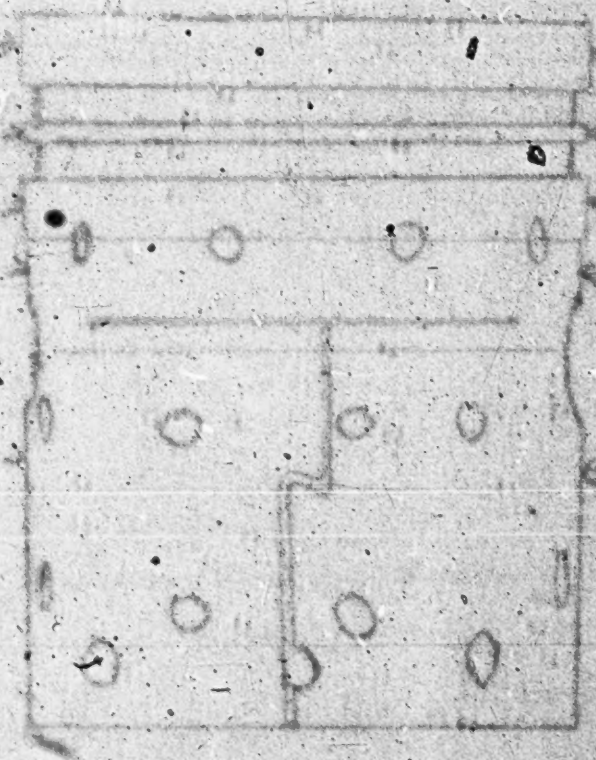
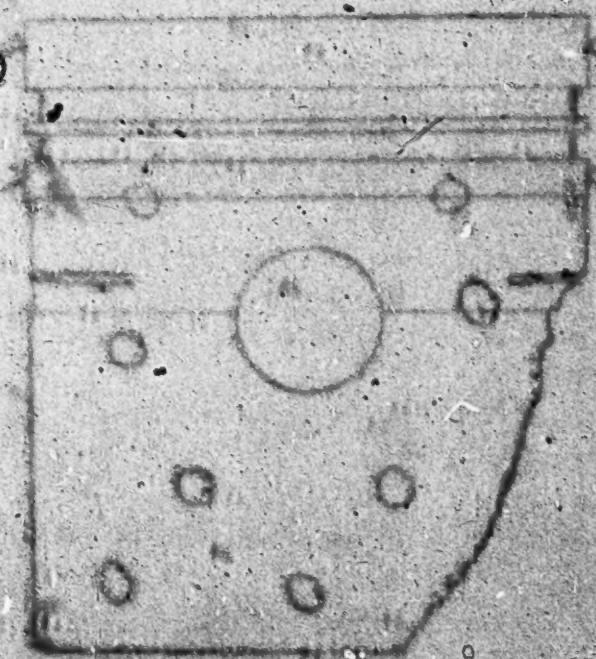




PLAINTIFFS' EXHIBIT NO. 84.

Abandoned Application of Ray E. Day for Patent.

(Filed January 27, 1934.)

Hearing: March 5, 1924.

IN THE UNITED STATES PATENT OFFICE.

DAY v. LONG v. MAYNARD v. JARDINE v. GULICK.

PATENT INTERFERENCE No. 49,576.

MOTION TO DISSOLVE.

PISTONS.

Application of Ray E. Day filed January 10, 1923, Ser. No. 611,698.

Application of Elmer C. Long filed January 17, 1921, Ser. No. 437,690.

Application of Howard E. Maynard filed January 3, 1921, Ser. No. 434,467.

Application of Frank Jardine filed March 9, 1921, Ser. No. 450,898, renewal of application filed March 11, 1920.

Application of Edward J. Gulick filed November 30, 1917, Ser. No. 204,661.

Mr. Clarence E. Mehlhope for Day.

Mr. Herbert G. Fletcher for Long.

Messrs. Whittemore, Hulbert & Whittemore and Mr. J. King Harness for Maynard.

Messrs. Richey, Slough and Watts for Jardine.

Mr. Ray S. Gehr for Gulick.

The party Long moves to dissolve on the ground that the count is unpatentable in view of the patents to

Spillman and Mooers, 1,029,870, Apr. 14, 1914, and

Ebbs, 700,309, May 20, 1902.

The count is as follows:

A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in

the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections and the skirt portion being split longitudinally of the piston to permit free expansion and contraction and the skirt portion being cut away adjacent the outer ends of the piston bosses.

The Spillman patent shows all the elements of the count except the connecting flanges in the zone of the bosses extending from the bosses to the skirt on both sides of the bosses and the longitudinal split in the skirt portion.

The first missing limitation would require connecting flanges between the pin bosses 12 and the skirt 2 of the patent substantially above the connections shown in Figures 2 and 3 and in a zone or circumferential belt which would include the bosses. This is a material limitation having a useful function.

The second missing limitation is not new in itself since the Ebbs patent shows a longitudinal split in the skirt but in cooperation with other elements not found in the Ebbs patent, it is a part of a new combination. It is noted that the claim was allowed to Gulick by the primary examiner after consideration of both patents cited.

The count is not satisfactorily anticipated by either reference or any reasonable combination of the references.

The motion is denied.

I. P. DISNEY,
Law Examiner.

Apr 4 1924

PLAINTIFFS' EXHIBIT NO. 85.

Certified Copy of the Drawings of the Abandoned Application of Ray E. Day, filed January 10, 1923, Serial No. 611,698.

(Filed January 27, 1934.)

(Received May 25 1932 Evans & McCoy)

390

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of the Drawings, in the matter of the Abandoned Application of Ray E. Day, Filed January 10, 1923, Serial Number 611,698, for Improvement in Pistons.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this twenty-first day of May, in the year of our Lord one thousand nine hundred and thirty-two and of the Independence of the United States of America the one hundred and fifty-sixth.

THOMAS E. ROBERTSON,
Commissioner of Patents.

(Seal)

ATTEST:

D. E. WILSON,
Chief of Division.

1581

E.

196/46

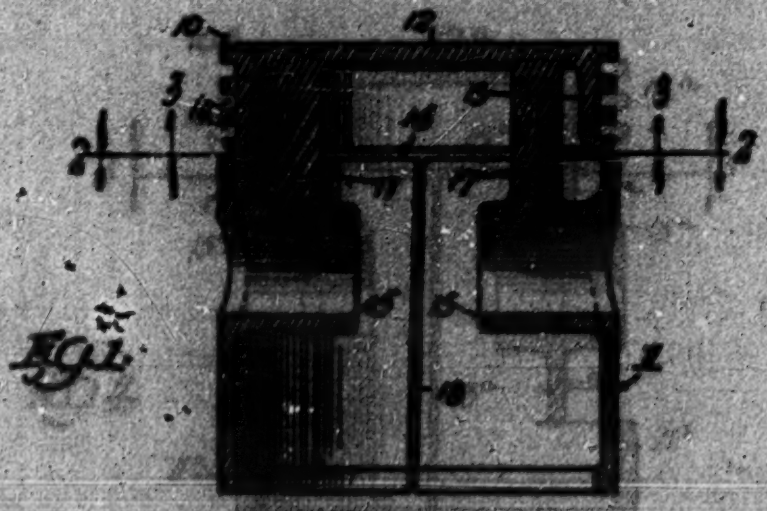


Fig. 1.

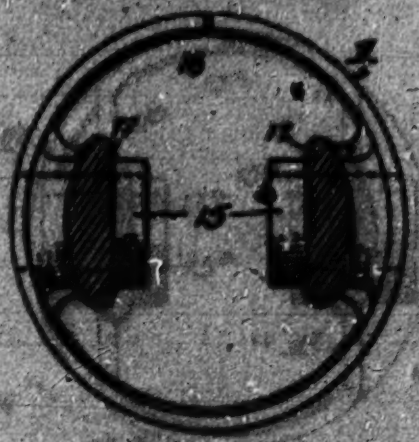


Fig. 2.

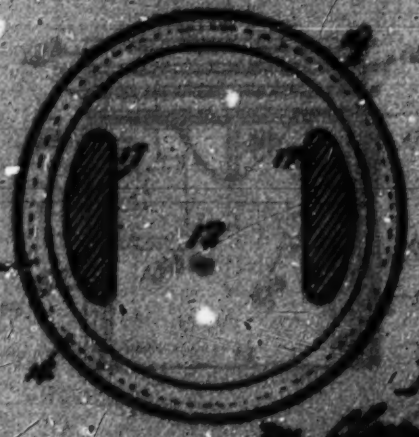
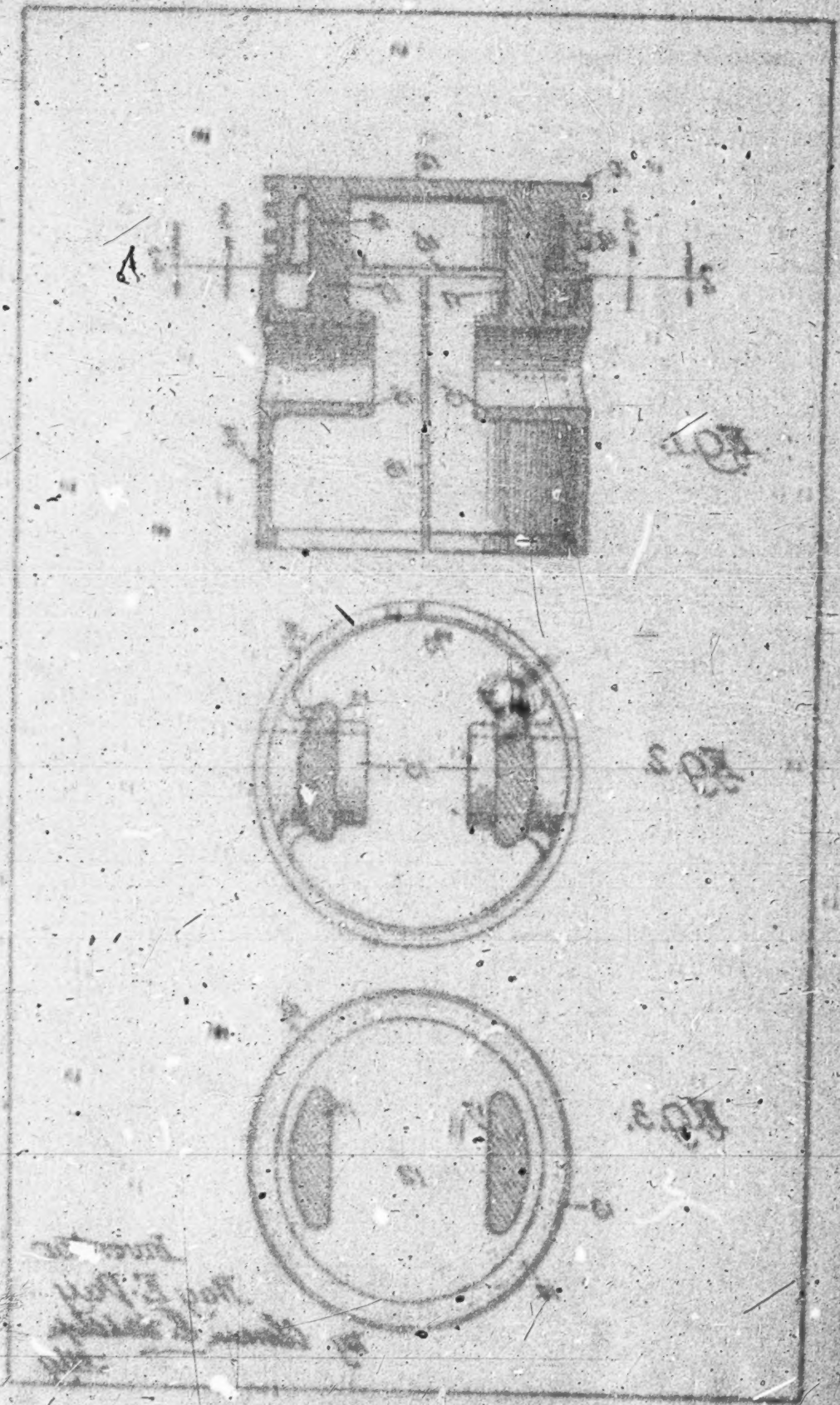


Fig. 3.

Inventor
Ray E. Day
By [illegible]
Atty.

PLAINTIFFS' EXHIBIT NO. 88(1).
Drawing of Abandoned Application of Ray E. Day.
(Filed January 27, 1934.)

1582



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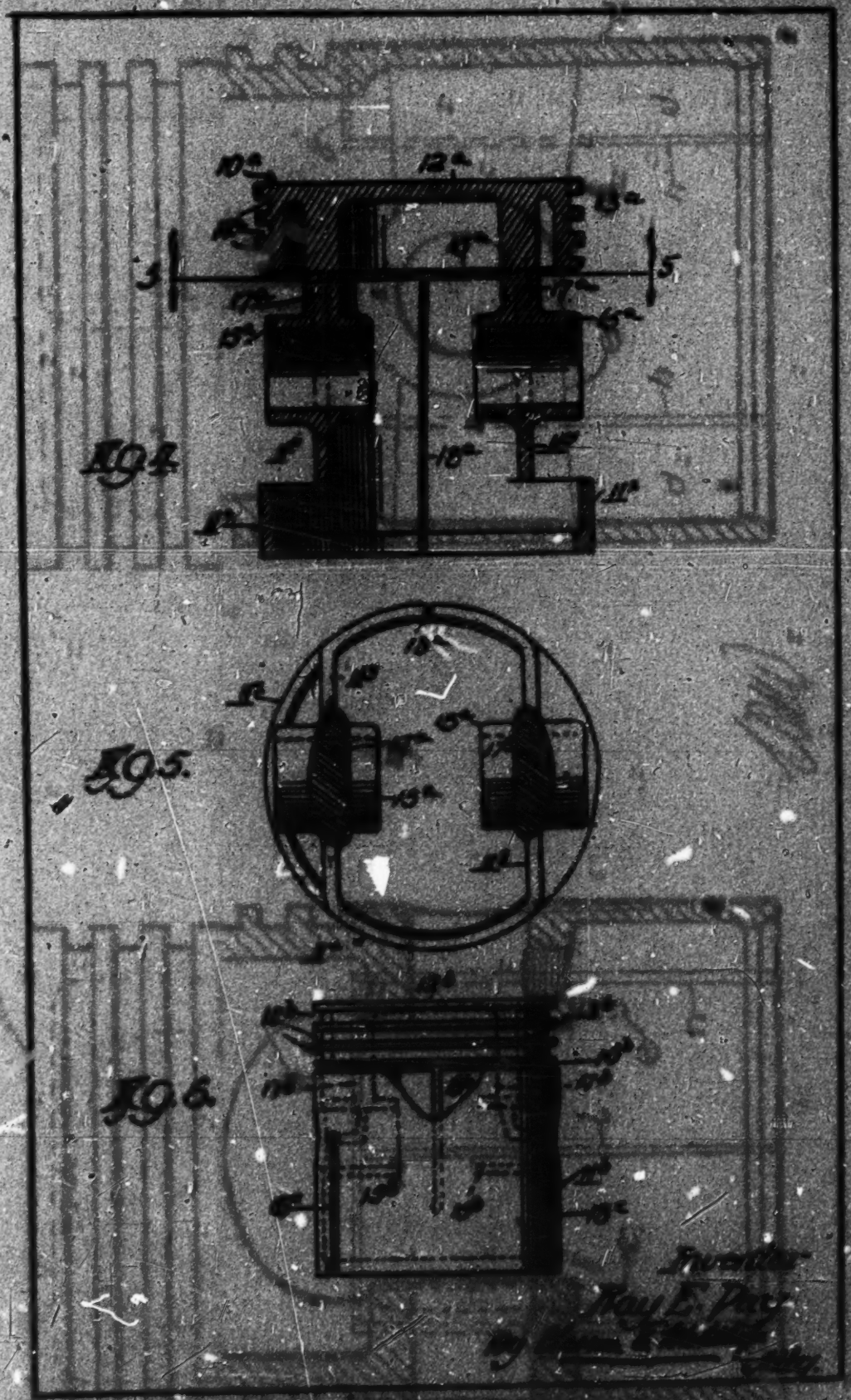

PLAINTIFF'S EXHIBIT NO. 38(2).
Drawing of Abandoned Application of Ray E. Page.
(Filed January 27, 1954.)

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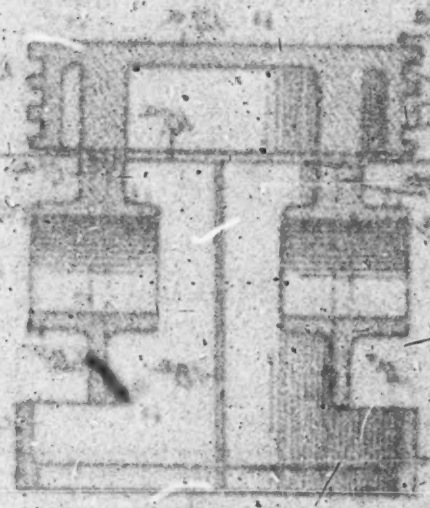
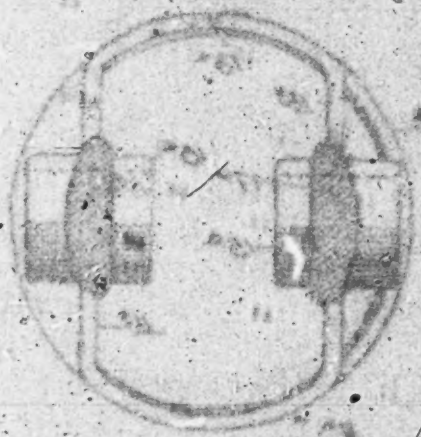
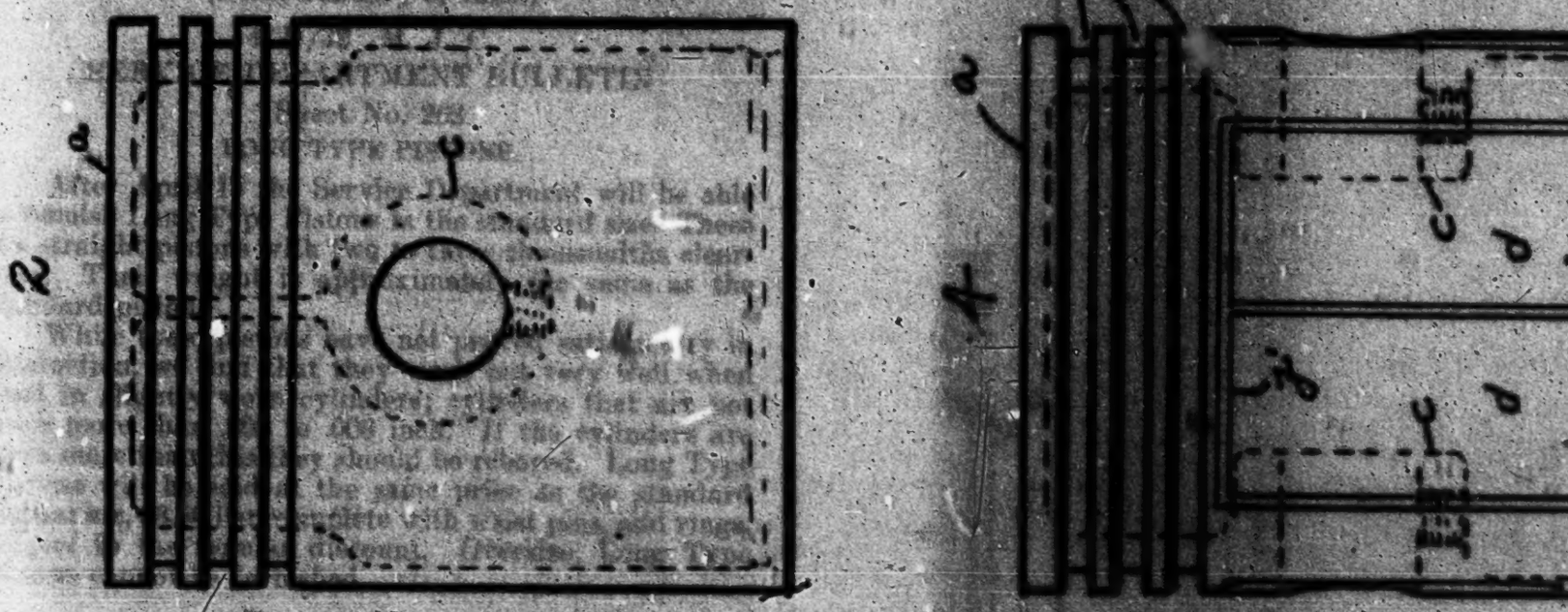
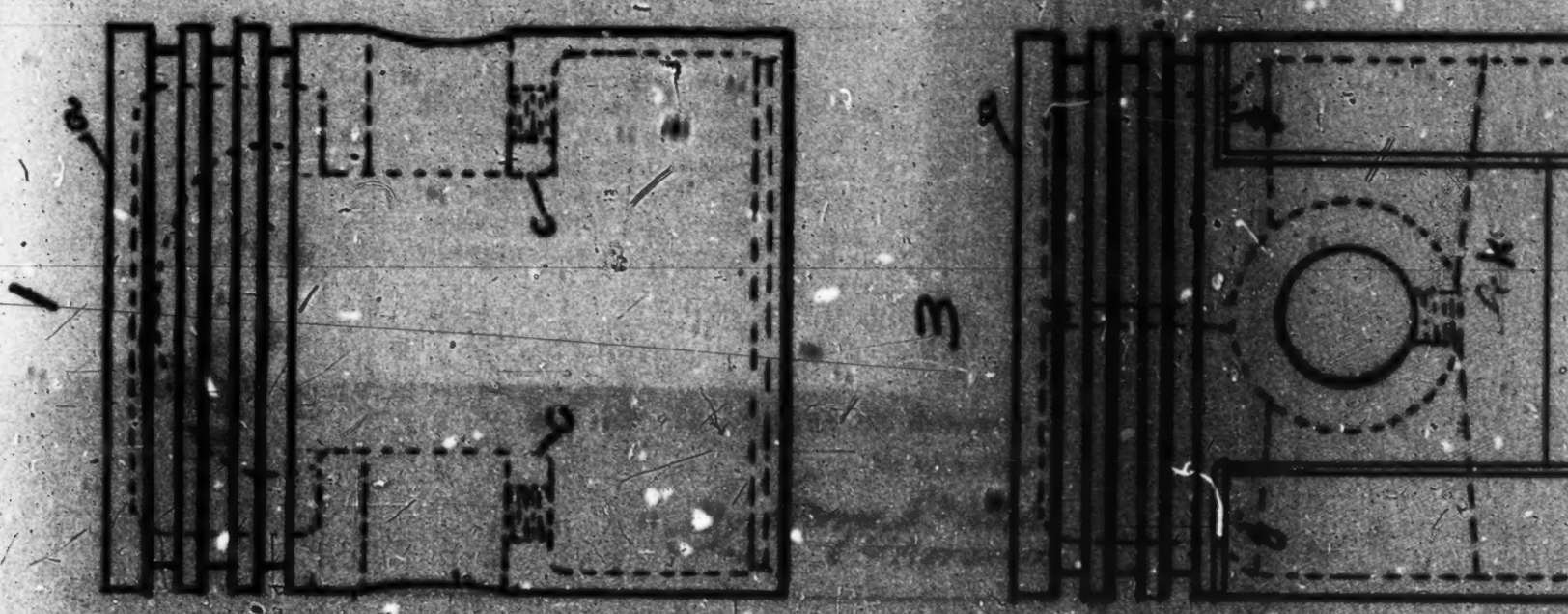


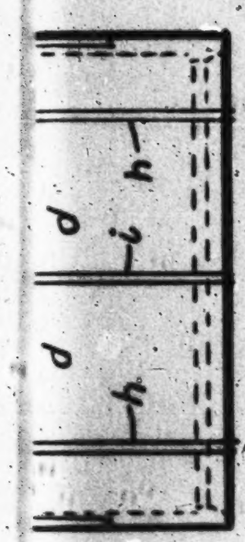


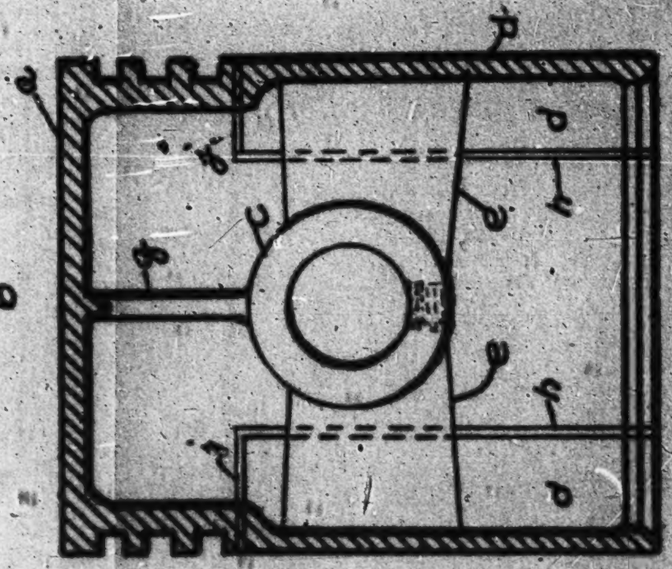
DEFTS' EXHIBIT A
4-13-33 M.J.C.

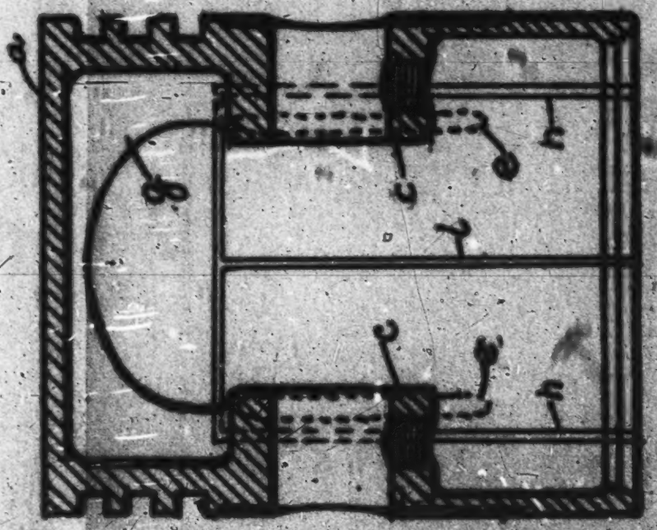


DEFENDANTS' EXHIBIT A.
Drawing produced by Vesmer of Long 1916 Pistol.
(Filed January 9, 1933.)









DEFENDANTS' EXHIBIT C.

Two Paragraphs from Service Department Bulletin, Sheet No. 262, April 8, 1920, of Franklin Automobile Company, entitled "Long Type Pistons."

(Filed January 9, 1933.)

4/27/32 M. J. C.

SERVICE DEPARTMENT BULLETIN

Sheet No. 262

LONG TYPE PISTONS.

After April 15 the Service Department will be able to furnish Long Type Pistons in the standard size. These are straight pistons with two to three thousandths clearance. Their weight is approximately the same as the standard piston.

While these pistons have not proved satisfactory in production, we find that they work out very well when used in slightly worn cylinders; cylinders that are not worn more than .005 to .006 inch. If the cylinders are worn more than this they should be rebored. Long Type Pistons will be sold at the same price as the standard piston; viz, $8.50 list, complete with wrist pins, and rings, subject to the regular discount. Oversize, Long Type pistons cannot be furnished.

FRANKLIN AUTOMOBILE COMPANY.

File these sheets.
April 8, 1920.

DEFENDANTS' EXHIBIT D.

Seven Paragraphs from Service Department Bulletin, Sheet No. 289, November 11, 1920, of Franklin Automobile Company, entitled "New Design for Series Nine."

(Filed January 9, 1933.)

SERVICE DEPARTMENT BULLETIN

Sheet No. 289.

NEW DESIGN FOR SERIES NINE

The distinct advantage as a material for pistons which an aluminum alloy with its very light weight and great ability to throw off heat has over cast iron, is conceded by all automobile engineers.

All of the Series 9 cars have been equipped with pistons made from this material and are giving satisfactory service. The Franklin design of these pistons as used in the past has been of the most up-to-date. The one disadvantage connected with their use has been the clearance which has been necessary between the pistons and walls of the cylinders.

Aluminum expands with the application of heat much more than cast iron, and for that reason in the past our pistons have required much more clearance to take care of this feature. This excessive clearance, particularly with a cold motor, has a tendency to make it noisy, to say nothing of affording an opportunity for the escape of gasoline past the rings and into the base, and also allowing an excess amount of oil to work up beyond the rings.

The Franklin engineers, however, realizing the particularly desirable features of the aluminum alloy piston have for the past three years been conducting exhaustive experiments with a view of securing a design such that the undesirable features would be eliminated. That has been accomplished. A new design has been perfected whereby we are now enabled to fit our aluminum pistons with two to three-thousandths clearance. This is the same amount of clearance as would be required for cast iron pistons in Series 9 motors. All motors going through production at this time are being fitted with this new piston known as the Long Piston and a more quiet motor with slightly increased ability is the result.

Fully realizing the fact that with the installation of this Long Piston in Series 9 motors already in service the same improved operation may be obtained to the present

owners, the Service Department has made the necessary preparations and is in position to supply this same piston in standard size, and can furnish it to you in the .015" and .030" oversize to take care of the overhaul work.

This new piston is a distinct improvement. We do not contemplate replacing the earlier type pistons in motors already out, except at owners' expense. Sell it to your owners with that idea in mind.

The price is $6.50 list for piston with wrist pin only.

FRANKLIN AUTOMOBILE COMPANY.

File these Sheets
November 11, 1920.

DEFENDANTS' EXHIBIT H.

Article from Franklin Service Bulletin No. 348, April 18, 1922, of Franklin Automobile Company, entitled "The Oval Type Piston."

(Filed January 27, 1934.)

FRANKLIN SERVICE BULLETIN

"To Reduce the Cost and Improve the Quality of Service"

Franklin Automobile Company, Syracuse, N. Y.

No. 348 April 18, 1922

THE OVAL TYPE PISTON

A piston which is ground oval in shape and for this reason known as the oval type piston has been going through production in small quantities since last Summer. The results being obtained with this piston are so successful that it may be adopted for standard production. In order to best understand what the oval

type piston is it is necessary to know some of its specifications:

	Oval Type	Long Type
Length of piston	4"	4- 1/16"
Length of piston skirt	2-13/16"	2-31/32"
Length of piston above wrist pin	2⅜"	2-15/32"
Circumference of piston	oval	round
Shape of piston	tapered	straight
Clearance at the diameter perpendicular to wrist pin		
At bottom of skirt	.003	.005
At top of skirt	.005	.005
Clearance in line with wrist pin		
At bottom of skirt	.012	.005
At top of skirt	.014	.005

The oval type piston has several advantages over the straight and round type of piston. Principal among them are:

1. The oval piston has a clearance of only .003 to .005 of an inch over a distance of 1¼ inches on each side of the piston at the diameter perpendicular to the wrist pin. This gives the oval piston the advantage of a close fit, but the tendency for tightening of the piston of the wrist pin due to friction between the cylinder and piston is avoided because of the much greater clearance at all other points.
2. The increased size of the combustion chamber due to the oval piston being 3/32 of an inch shorter from the center line of the wrist pin to the top of the piston reduces the tendency for pinging.

DEFENDANTS' EXHIBIT I.

Article from Page 1, Franklin Service Bulletin No. 369, Feb. 20, 1923, of Franklin Automobile Company, entitled Piston and Wrist Pin Knocks, and Drawing on Page 2, entitled "Drill Jig for Extra Oil Holes in Piston."

(Filed January 3, 1933.)

4/27/32. M.J.C.

FRANKLIN SERVICE BULLETIN

"To Reduce the Cost and Improve the Quality of Service"

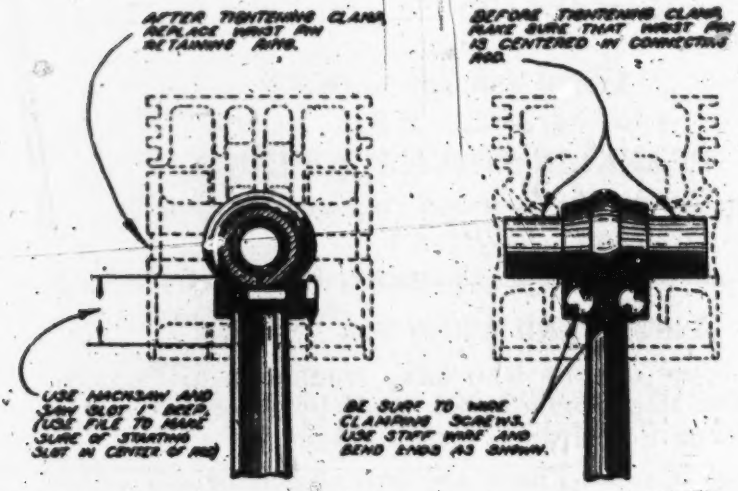
Franklin Automobile Company, Syracuse, N. Y.

PISTON AND WRIST PIN KNOCKS

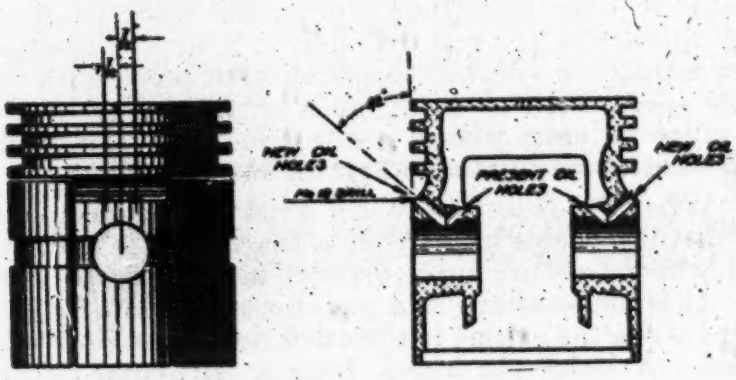
For those dealers who have trouble in distinguishing a piston slap from a knock made by a loose wrist pin, the following descriptions will be helpful.

Piston Slaps.—There are two characteristic piston noises, one known as a "slap" and the other as a "ping." A slap is more noticeable when the engine is cold and tends to disappear when the engine is hot. A "ping" doe not appear until the engine is hot. A slap gives a much sharper noise than a ping, and since a slap usually appears in but one cylinder, it is of less frequency than a ping. A constant application of power at a moderate speed, such as going up a slight incline at 18 or 20 miles an hour with a cool engine, will bring out a slap more distinctly than anything else.

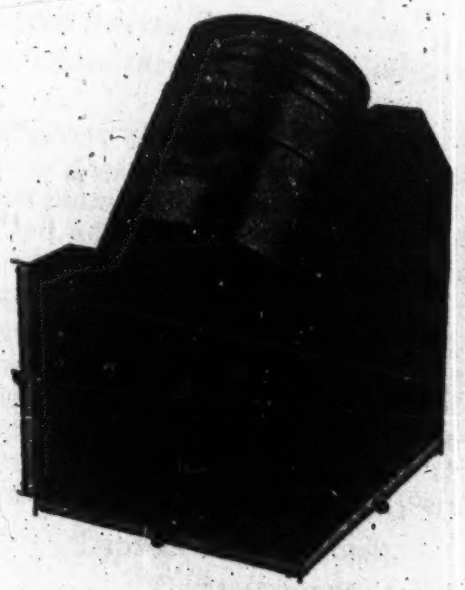
Wrist Pin Knocks.—Worn wrist pins cause a slight but distinct double knock that is heard only at low speed, and which becomes more distinct as the engine warms up. It is not so sharp as a piston slap and can be easily heard when the engine is throttled down to a slow idling speed. A wrist pin knock from a particular cylinder disappears if the compression is relieved by removing the spark plug.



INSTALLATION OF WRIST PIN CLAMP.



LOCATION OF NEW OIL HOLES IN SERIES 10 PISTON.



DEFENDANTS' EXHIBIT J.

Forfeited and Abandoned Application of William M. Venner for Improvement in Pistons, filed April 12, 1920, Serial Number 373,340.

(Filed January 27, 1934.)

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DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of the Petition, Specification, Oath and Drawing, as originally filed, in the matter of the Forfeited and Abandoned Application of William M. Venner, filed April 12, 1920, Serial Number 373,340, for Improvement in Pistons.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this sixteenth day of September, in the year of our Lord one thousand nine hundred and thirty-one and of the Independence of the United States of America the one hundred and fifty-sixth.

THOMAS E. ROBERTSON,
Commissioner of Patents.

(Seal)

ATTEST:

D. E. WILSON,
Chief of Division.

(Mail Room Apr 12 1920 U. S. Patent Office.)

(U. S. I. R. Documentary Stamp 25 Cents.)

Application for U. S. Letters Patent

PETITION.

To the Commissioner of Patents:

Your petitioner, William M. Venner, a citizen of the United States, residing at South Bend, in the County of St. Joseph and State of Indiana, and whose post-office address is 316 Hamden Court, in said city, prays that

Letters Patent may be granted to him for the improvement in Pistons set forth in the annexed Specification.

And I hereby appoint GEORGE J. OLTSCH, 711-12 Studebaker Building, South Bend, Indiana, U. S. A., Register No. 9371, Attorney, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to sign my name to the drawings, to receive the Letters Patent, and to transact all business in the United States Patent Office connected therewith.

Signed at South Bend, in the County of St. Joseph and State of Indiana, this 8th day of April, 1920.

☞ (Sign here
First name in Full.) WILLIAM M. VENNER.

SPECIFICATION.

To All Whom it May Concern:

BE IT KNOWN, That I, William M. Venner, a citizen of the United States, residing at South Bend, in the County of St. Joseph, and State of Indiana, have invented certain new and useful improvements in Pistons, of which the following is a specification:

373340—1

The invention relates to pistons and has for its object to provide a piston especially adapted for use in air cooled internal combustion engines, and to provide a piston so constructed that the use of aluminum and other light metals may be accomplished, thereby giving lightness of reciprocating parts, which metals have a greater relative degree of expansibility than the cylinder casings under the same temperature. Pistons of aluminum and alloys on account of their relative greater degrees of expansibility than the cylinder casings tend to seize the cylinders under high temperatures unless considerable clearance is provided and too much clearance is impractical, as the pistons will slap under low temperature, therefore it is the primary object of the invention to provide a skirt for the piston formed in sections, which sections are supported by downwardly extending webs, which webs are spaced apart at their bottoms and so constructed that they will have a relatively narrow width in proportion to their length so that the expansion of the webs will be more in the direction of their length than width. The lengthwise expansion

being unlimited thereby the web supported skirt sections will not seize the cylinder.

With the above and other objects in view the invention resides in the combination and arrangement of parts as hereinafter set forth, shown in the drawings, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within

the scope of what is claimed without departing from the spirit of the invention.

In the drawings:—

Fig. 1 is a side elevation of the piston.

Figure 2 is a vertical sectional view taken on line 2—2 of Figure 1.

Figure 3 is a horizontal sectional view taken on line 3—3 of Figure 2.

Referring to the drawings, the numeral 1 designates a piston and 2 the head thereof. The head 2 is provided with a plurality of piston ring grooves 3 for the reception of piston rings of any conventional form. The piston is made from aluminum or any other light metals, or from any metal which has a greater expansibility than the cylinders in which it may be used. Pistons of this character in the past, on account of their greater expansibility than the cylinders ~~on~~ in which they are used have been found, when subjected to extreme temperatures, to bind or seize the bore of the cylinders, and where sufficient clearance has been allowed in the skirt of the piston under low temperatures the piston slaps. To overcome the above object the skirt 4 of the piston is slit as at 5 and 6 so as to form skirt sections 7, which sections form a major area entirely separated from the remaining wall sections 8 of the skirt 4. The adjacent edges of the skirt sections so formed being spaced from each other so as to allow independent movement when the piston is subjected to high or low temperatures.

The head 2 of the piston is provided with a cham-

ber 9 and depending downwardly from said chamber and integrally connected to the head 2 are webs 11 and 12. Webs 11 extend downwardly and are integrally connected to the skirt sections 8 and merge into bearings 13 for the wrist pin. The webs 12 extend downwardly and outwardly and are of greater length than width and have integrally connected to their ends the

skirt sections 7. It will be seen that by having the web sections 12, independent of each other and of greater length than width, that when the piston is subjected to high temperatures the expansion of the webs will be more in the direction of their length than in the direction of their width and that the length-wise expansion may be of any degree without causing the skirt to seize the cylinder. It will also be seen that by having the major area of the skirt in the skirt sections 7 which are entirely separated from the remaining skirt portions 8 and the major area sections 7 being supported entirely by the elongated webs 12 integrally formed with the head 2 of the piston, that the expansion will be longitudinally and not laterally, thereby maintaining a snug fit of the piston as a whole during high or low temperatures so as to overcome the difficulty at present experienced where pistons are made of aluminum or other metals, which have a greater expansibility than the cylinder. By providing supporting webs for the skirt sections, which webs are of greater length than width so that expansion of the webs will be lengthwise, the difficulty heretofore experienced in split skirts for pistons is obviated.

The invention having been set forth what is claimed as new and useful is:—

1 The combination with a piston head, of a skirt therefor, said skirt being formed from independent sections, and webs carried by the piston head and supporting the independent sections, said webs being of greater length than width, thereby insuring longitudinal expansion and contraction.

2 The combination with a piston head, of a skirt therefor, said skirt being formed in sections, some of said sections being carried by the piston head, the other sections being independent, the independent sections being supported by webs carried by the piston head, said webs being of greater length than width so that they will expand and contract longitudinally.

3 The combination with a piston head, of a skirt therefor, said skirt being formed in sections, some of said sections being integrally connected to the piston head, the other sections being independent of the piston head, and downwardly extending webs carried by the piston head and supporting the independent sections, said webs being of greater length than width, thereby

causing longitudinal expansion of the webs when subjected to heat.

4 The combination with a piston head, of a skirt therefor, said skirt being formed in sections, some of said sections being carried by and integrally joined to the piston head, the other sections being independent of the piston head, downwardly and outwardly extending webs carried by the piston head and supporting the independent sections, said webs being of greater length than width so as to insure longitudinal expansion and contraction.

373340—5

5 The combination with a piston head, of a skirt therefor, said skirt being formed in sections, some of said sections being carried by the piston head, the other sections being independently supported in relation to the piston head, webs carried by the piston head and supporting the independent sections, said independent sections comprising the major area of the skirt, said webs being of greater length than width thereby insuring longitudinal expansion and contraction.

6 The combination with the head of a piston, of a skirt therefor, said skirt being formed in sections, some of said sections being integrally connected to the piston head, the other sections being independent of the piston head, said independent sections comprising the major area of the skirt, and downwardly extending independent webs for supporting the independent sections, said webs being of greater length than width, thereby insuring longitudinal expansion and contraction.

373340—6

In Testimony Whereof I affix my signature.

William M. Venner.
(Sign here First name in Full.)

OATH

State of Indiana,
County of St. Joseph, ss:

William M. Venner, the above-named petitioner, being duly sworn, deposes and says that he is a citizen of (1) the United States, and resident of South Bend, Indiana; that he verily believes himself to be the original, first, and (2) sole inventor of the improvements in Pis-

tions described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvement has been filed by him or his representatives or assigns in any country foreign to the United States.

☞(Sign here
First name in Full.) WILLIAM M. VENNER.

SWORN to and subscribed before me this 8th day of April, 1920.

ORLO R. DEAHL,
(Official Signature)
Notary Public.
(Official Character)

(Notarial Seal)

[Seal here, to be impressed in paper.]

My commission expires Mar 30, 1921.

☞NOTE.—Acknowledgment should be made before a Notary Public, *who must affix his seal.* If executed before an officer not provided with a seal, the Certificate of the Judge or Clerk of County Court must be affixed, showing official character of such officer.

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Fig. 1.

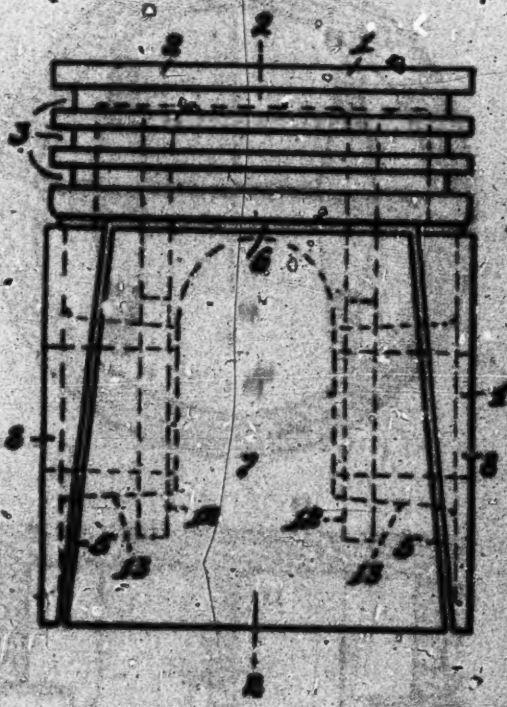


Fig. 2.

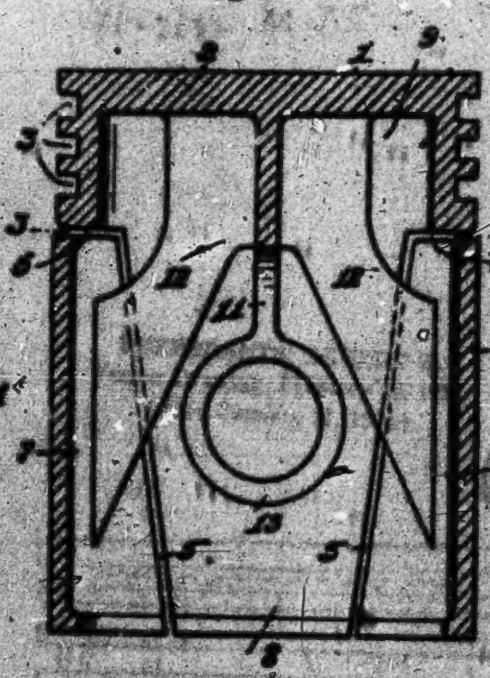
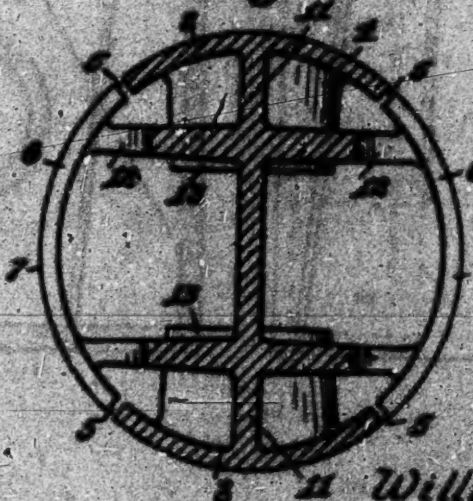
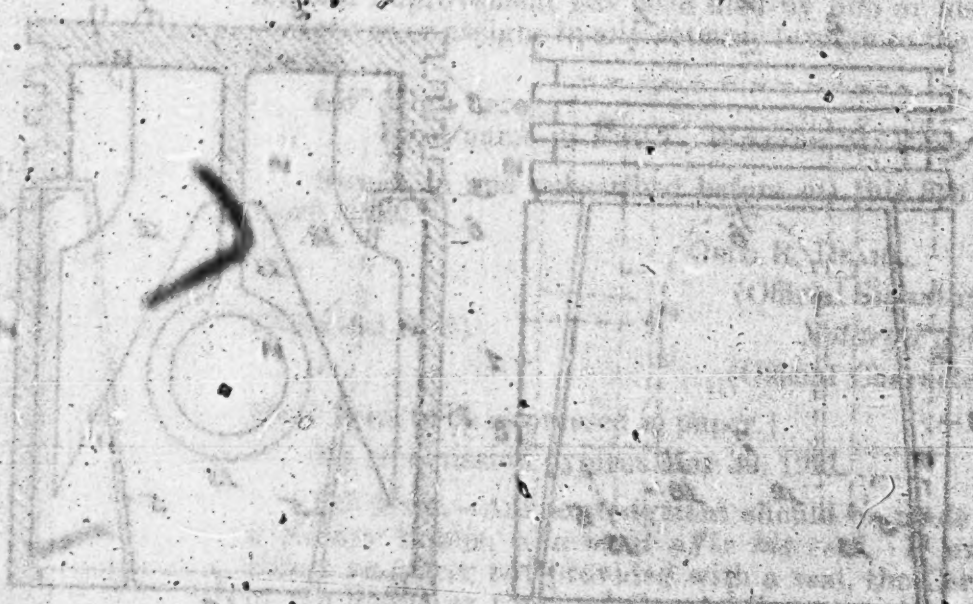


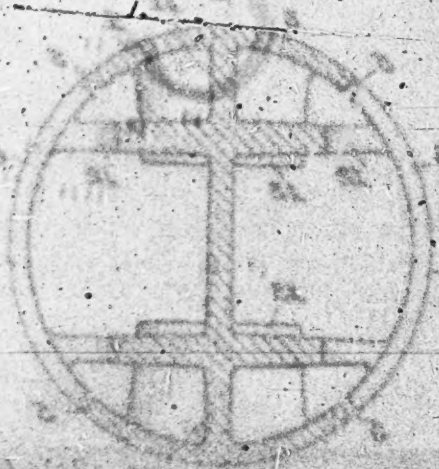
Fig. 3.



William M. Venner
INVENTOR

By George P. Welch
ATTORNEY





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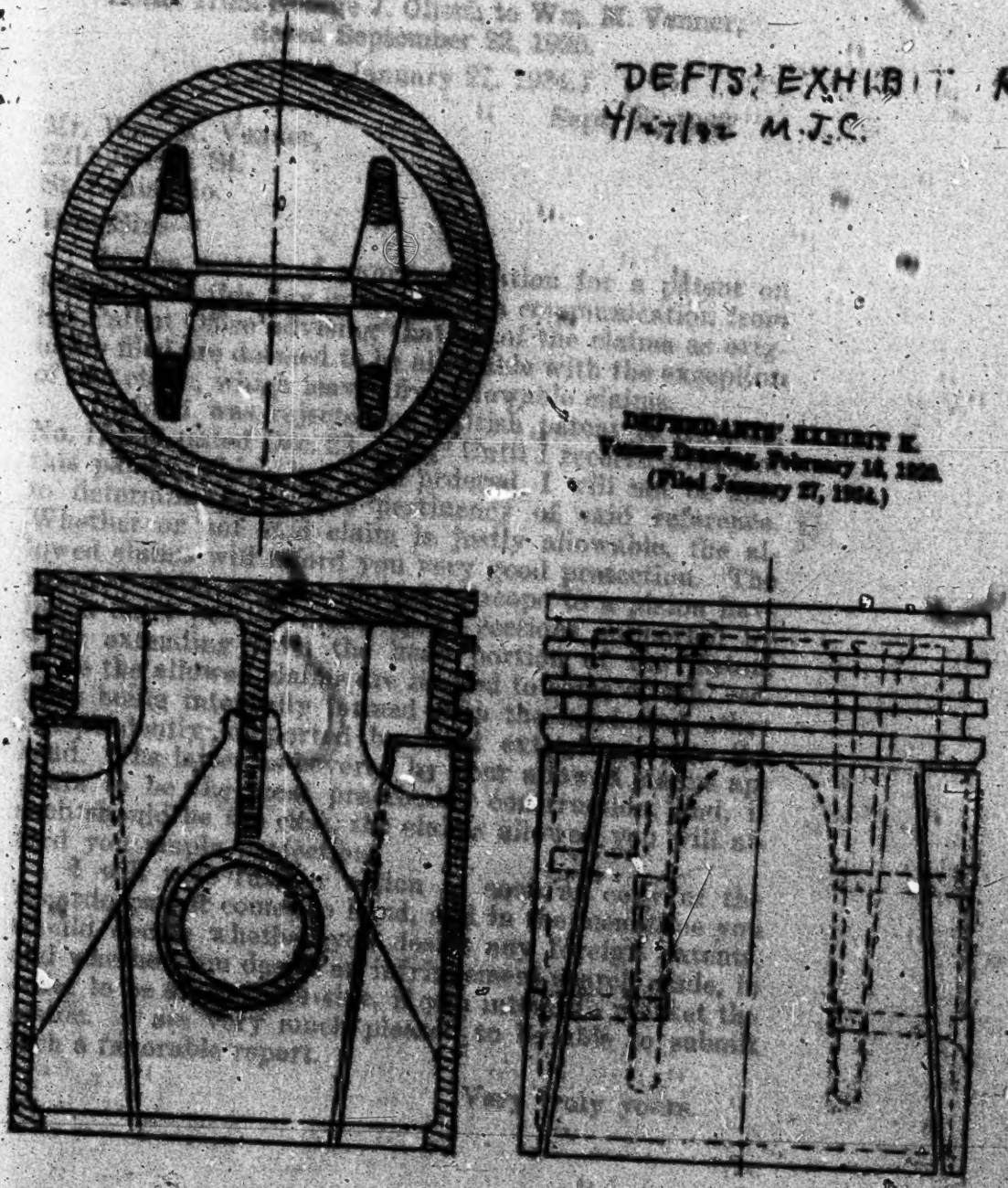
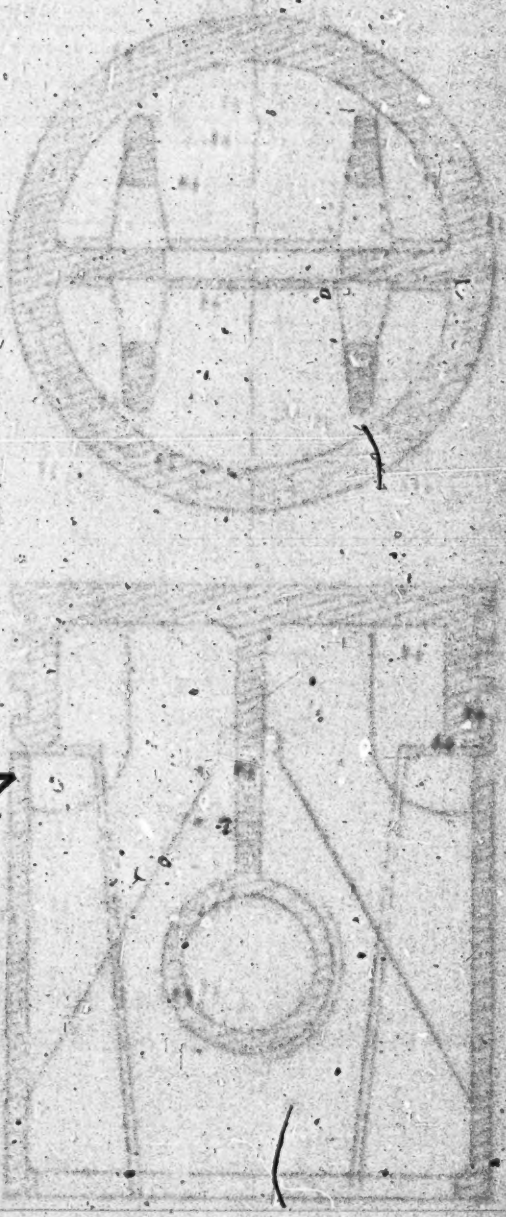
DEFTS' EXHIBIT K
4-7-32 M.J.C.



DEFENDANTS' EXHIBIT K.
Verner Hearing, February 14, 1928.
(Filed January 27, 1934.)

W. G. Verner,
South Bend, Ind.

1604



DEFENDANTS' EXHIBIT L.

Letter from George J. Oltsch to Wm. M. Venner, dated September 22, 1920.

(Filed January 27, 1934.)

Sept. 22, 1920.

Mr. Wm. M. Venner,
2217 Locust St.
St. Louis, Mo.

Dear Sir:—

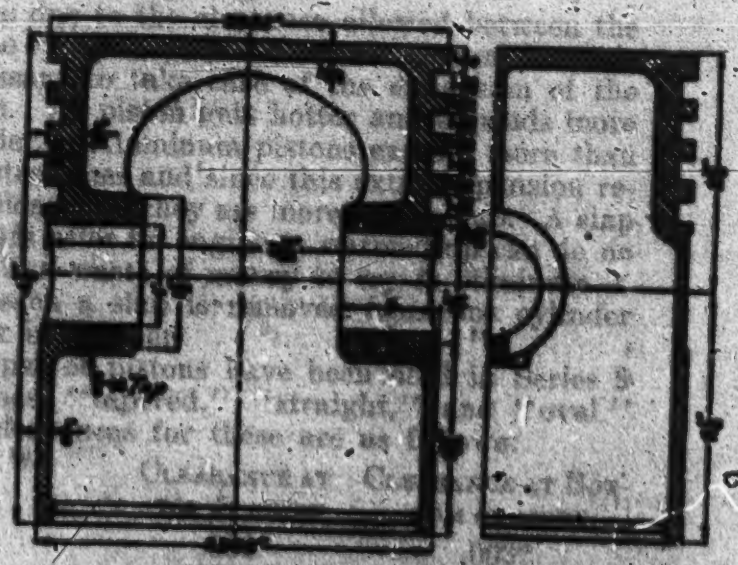
In the matter of your application for a patent on Piston, I am this day in receipt of a communication from the Patent Office advising that all of the claims as originally filed are deemed to be allowable with the exception of one claim, which leaves five allowable claims.

Claim 1 was rejected on British patent to Ricardo, No. 17,953, dated Dec. 23, 1915. Until I receive a copy of this patent, which has been ordered, I will not be able to determine as to the pertinency of said reference. Whether or not said claim is justly allowable, the allowed claims will afford you very good protection. The rejected claim was not limited in scope to a piston having a skirt portion made up of sections supported by webs extending from the head portion of the piston, while the allowed claims are limited to some of said sections being integrally formed with the head, and other independently supported by webs extending from the head. The latter as covered by your allowed claims appears to be the most practicable construction, and, if such should be the case, the claims allowed you will afford you ample protection.

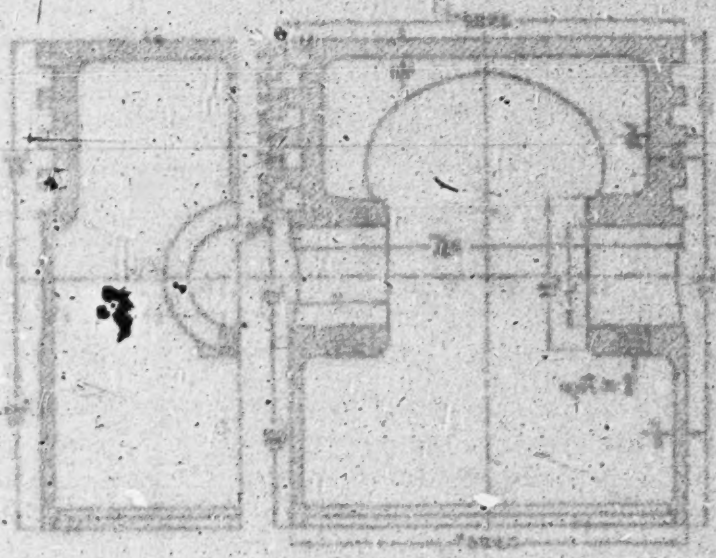
I will take further action as soon as copy of the Ricardo patent comes to hand, and in the meantime you should decide whether you desire any foreign patents, and whether you desire an infringement search made, in order to be on the safe side, if you intend to market the piston. I am very much pleased to be able to submit such a favorable report.

Very truly yours.

Cut reproduced from The Gasoline Automobile by Heldt, Vol. 1. (p. 169)



DEFENDANTS' EXHIBIT M.
Photostat of page 169, showing Cut only in "The Gasoline Automobile," by Heldt, Vol. 1.
(Filed January 27, 1926.)



DEFENDANTS' EXHIBIT N.

Article from Pages 8 and 9 of Manual for Trouble Shooters of Franklin Automobile Company, entitled "Piston Slap."

(Filed January 27, 1934.)

PISTON SLAP

A slap is more noticeable when the engine is cold and tends to disappear when the engine is hot. It gives a much sharper noise than a "ping" and since a slap usually appears in but one cylinder, it is of less frequency than a ping. A constant application of power at a moderate speed, such as going up a slight incline at 18 or 20 miles an hour with a cool engine, will bring out a slap more distinctly than anything else.

Slaps are due to the clearance allowed between the piston and the cylinder walls. A certain amount of clearance is necessary to take care of the expansion of the heated piston. (A piston gets hotter and expands more than a cylinder.) Aluminum pistons expand more than cast-iron or steel ones and since this extra expansion requires more clearance, they are more apt to slap. A slap that disappears after an engine is warmed up can do no harm and it is a waste of money to try to eliminate it. Often when such a slap is removed from one cylinder it will appear in another.

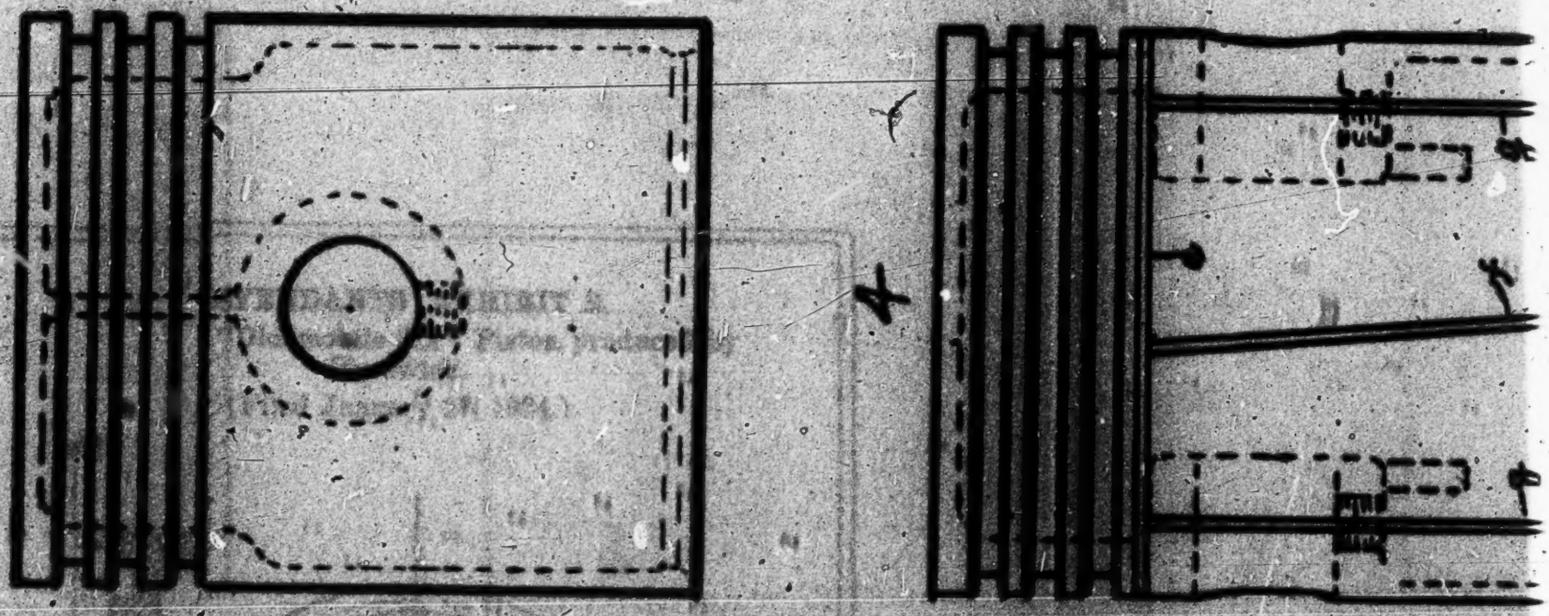
Three types of pistons have been used in Series 9 and 10 engines, "tapered," "straight," and "oval." The proper clearances for these are as follows:

Piston	Clearance at top of skirt	Clearance at bottom of skirt
Tapered	.008"	.003"
Straight	.005"	.005"
Oval	.005"	.003"

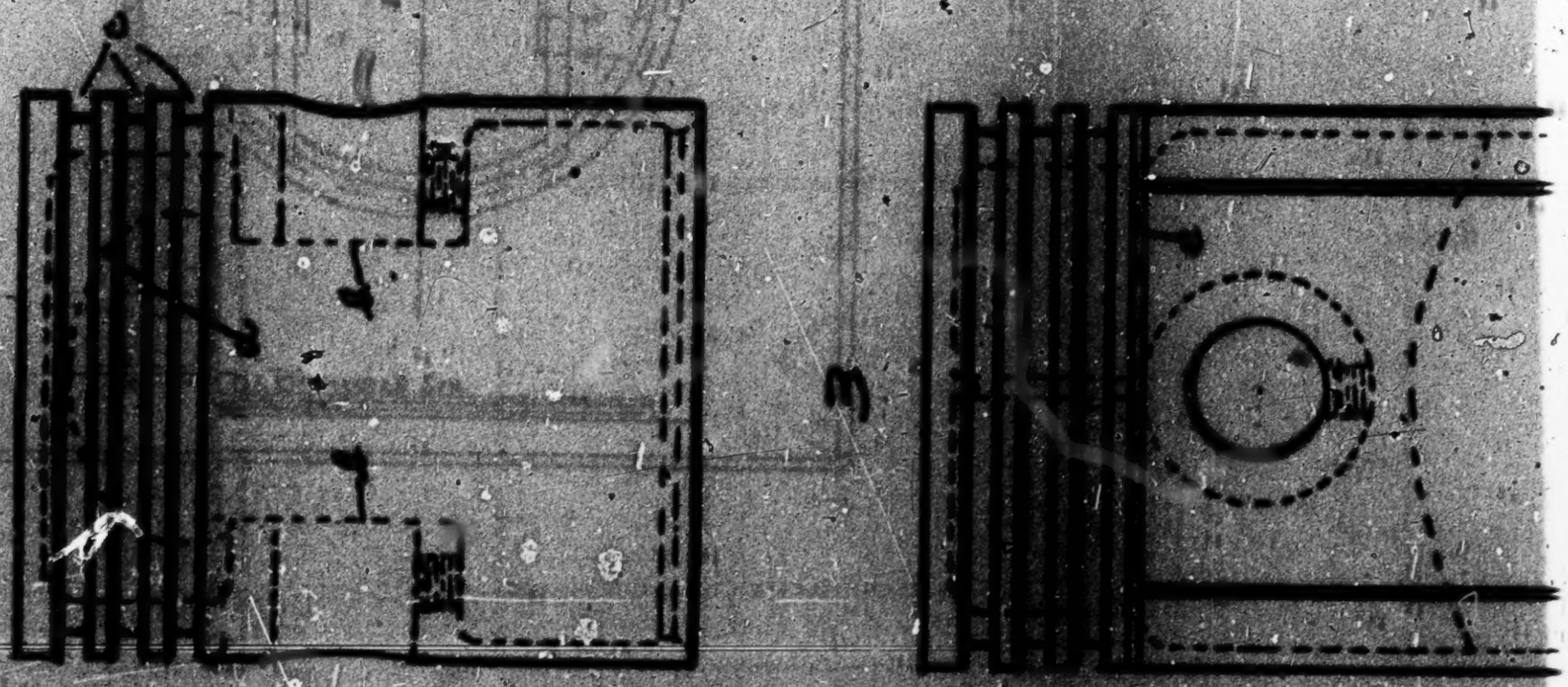
The original clearance of a piston and cylinder is given by the figures stamped on the head of the piston and on the bottom of the cylinder flange.

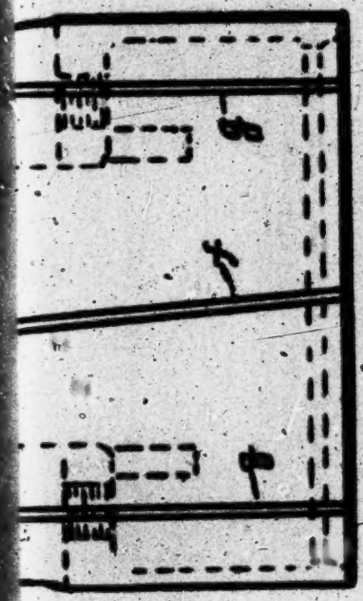
To determine which piston is slapping, run the engine at the speed at which the slap is most noticeable and then short circuit the spark plugs one at a time with a screw-driver. When the slapping cylinder is short circuited, the slap will be much less noticeable or will disappear entirely. Another method of locating a slap is to have the engine idling and then to open the throttle in short, sudden jabs, feeling each cylinder with the point

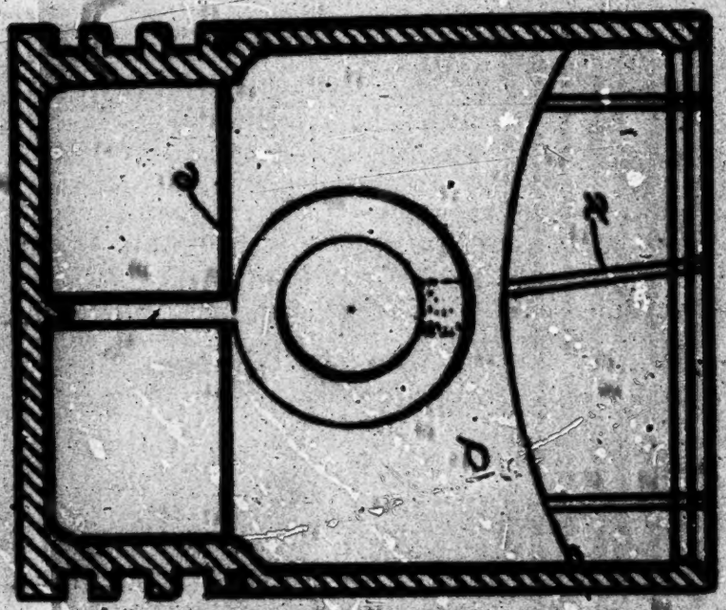
of a small screw-driver held just under the cooling fins as this is done. A distinct tap can be felt on the slapping cylinder. Another method is to use a long screw-driver as a "listening rod," placing the blade of the screw-driver against the cylinder and the handle against the ear. [The only remedy for a slapping piston is to install a larger piston or a smaller cylinder. If the cylinder should be too badly worn (over .005") to install a new piston, the cylinder can be reground by the factory for a nominal charge and an oversize piston installed.]

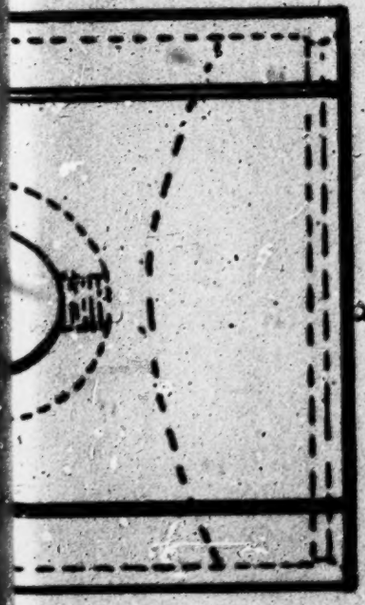


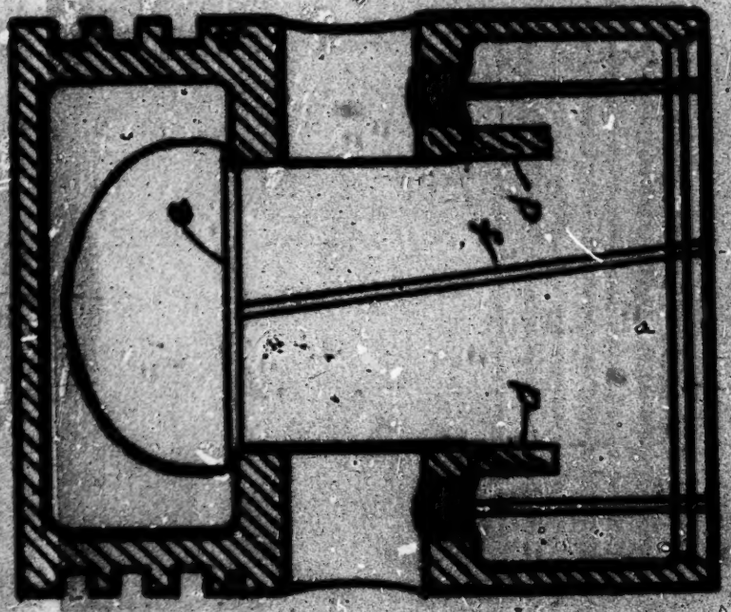
DEFENDANTS' EXHIBIT O.
Drawing produced by Chadwick, Long & Hoe Piston.
(Filed January 27, 1904.)

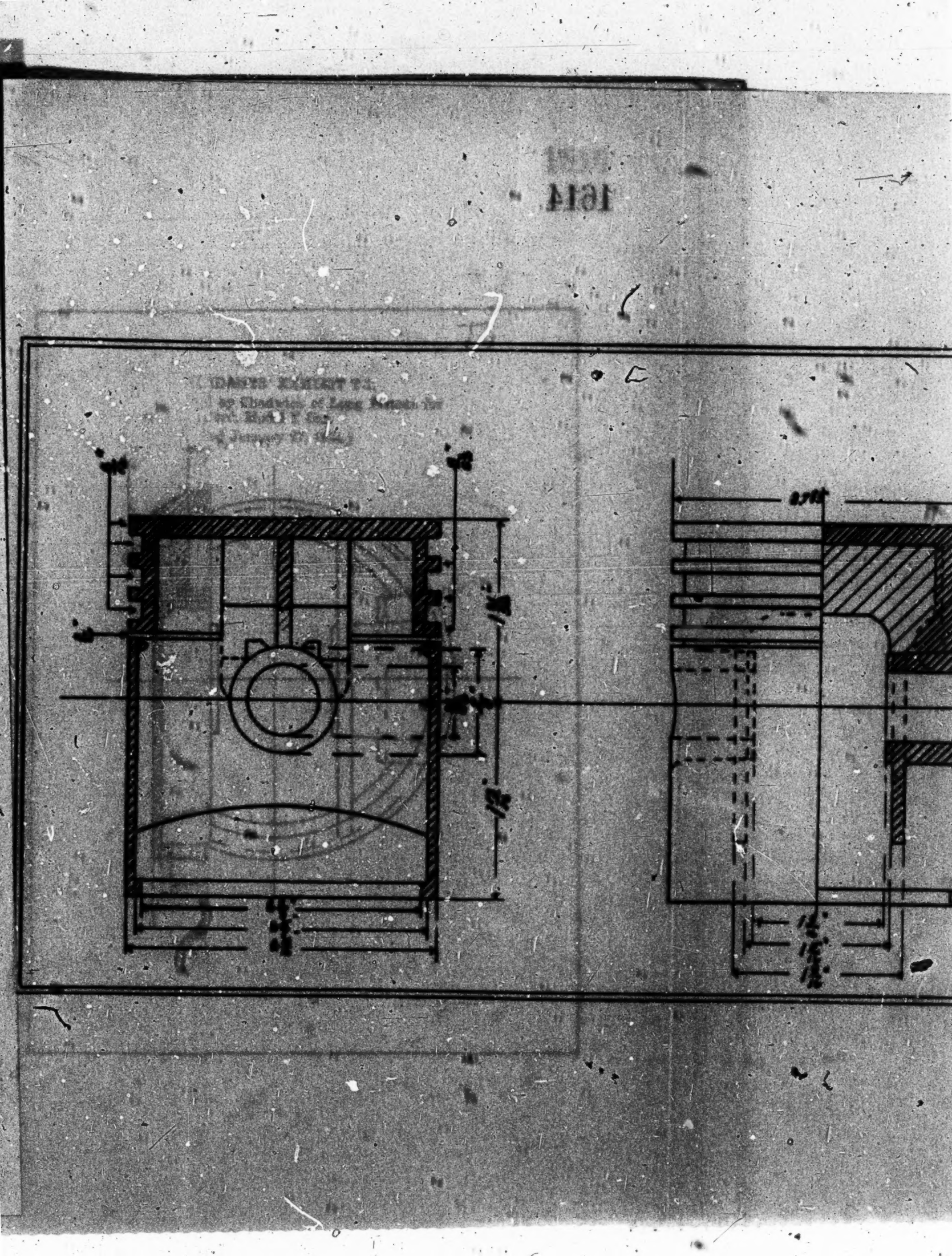




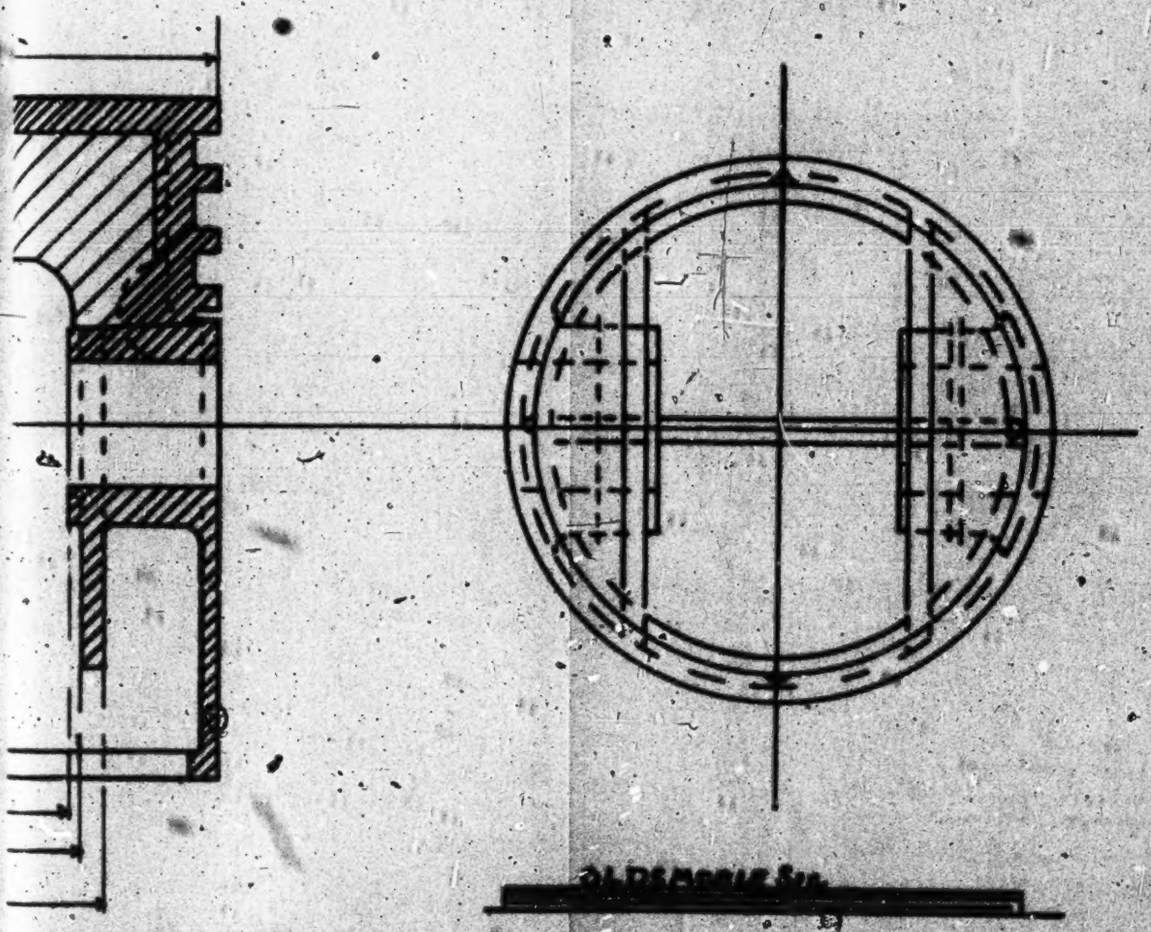


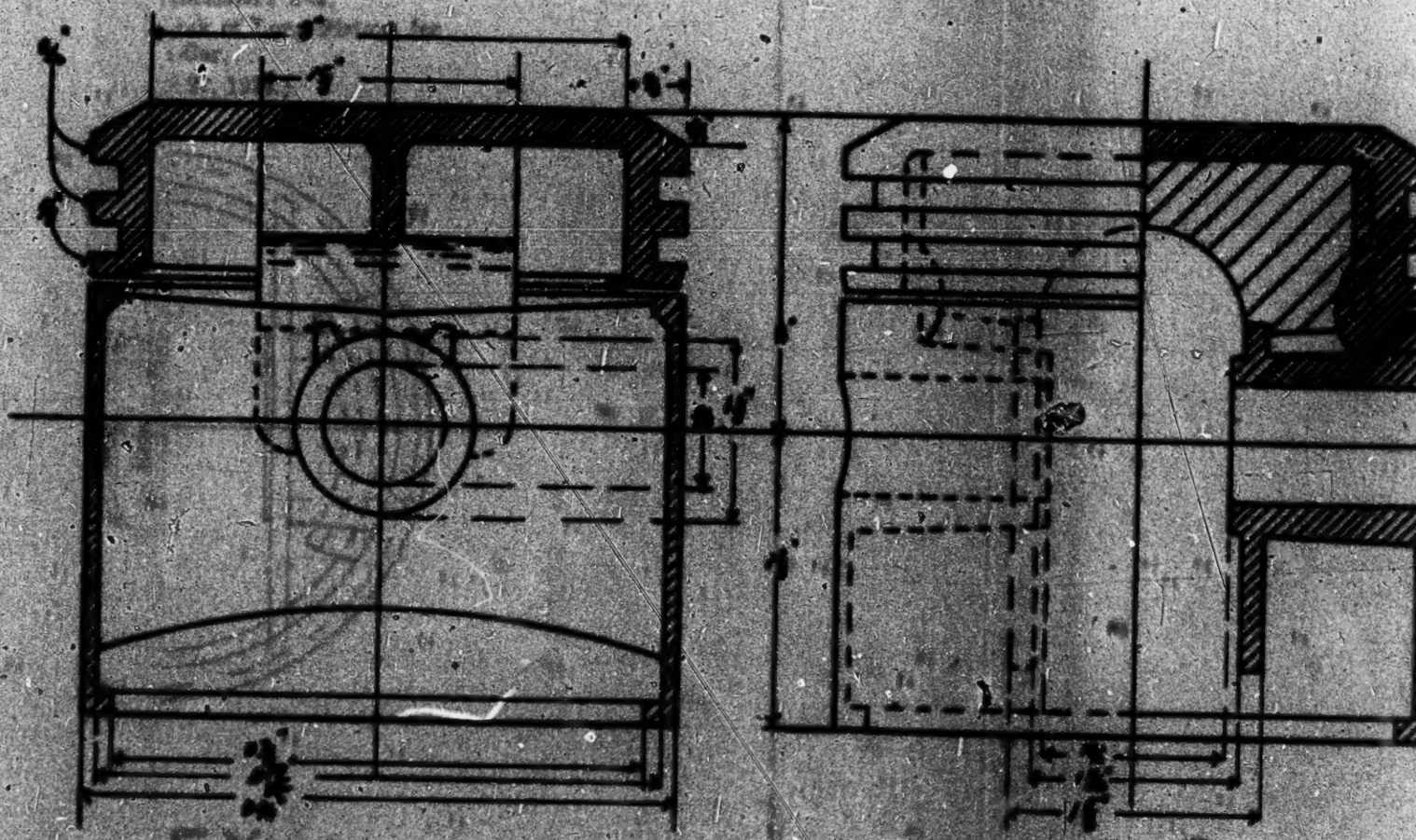






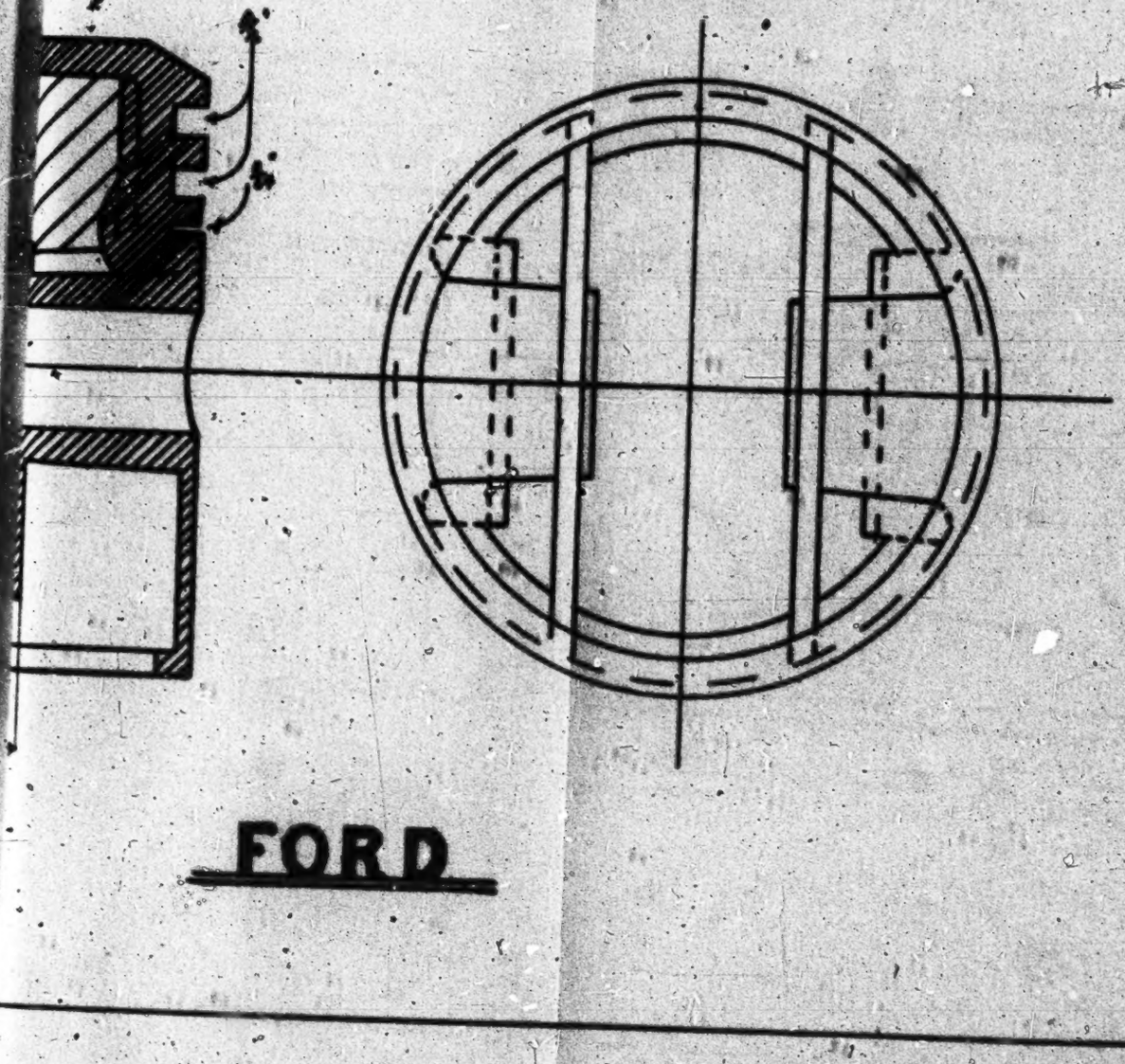
DEFENDANTS' EXHIBIT 8.
Tracing of "Oldsmobile Six" Piston produced by Chadwick.
(Filed January 27, 1934.)

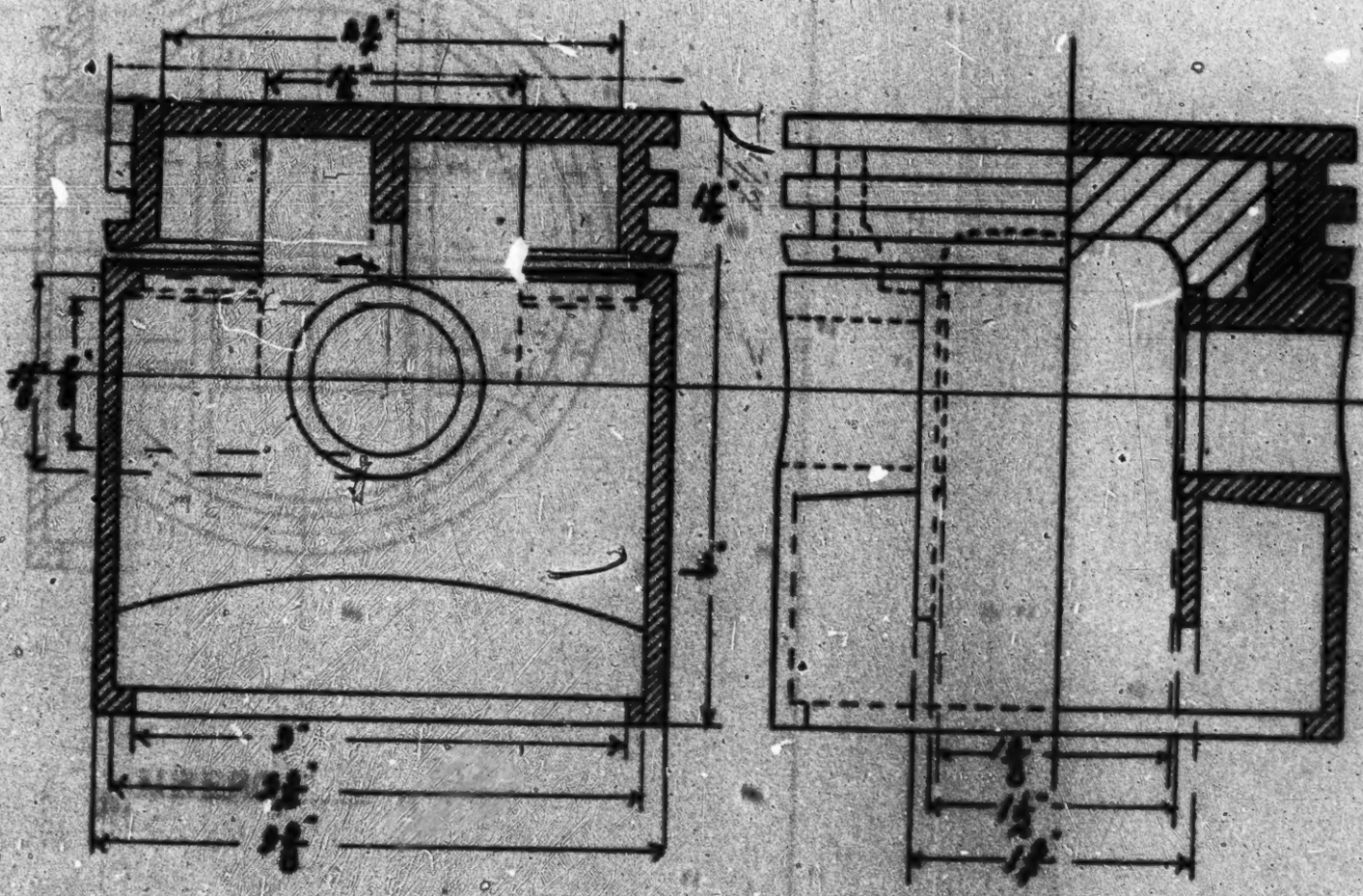




T1

DEFENDANTS' EXHIBIT T-1.
Tracing produced by Chadwick of Long Pistons for Ford, Model T Car.
(Filed January 27, 1934.)





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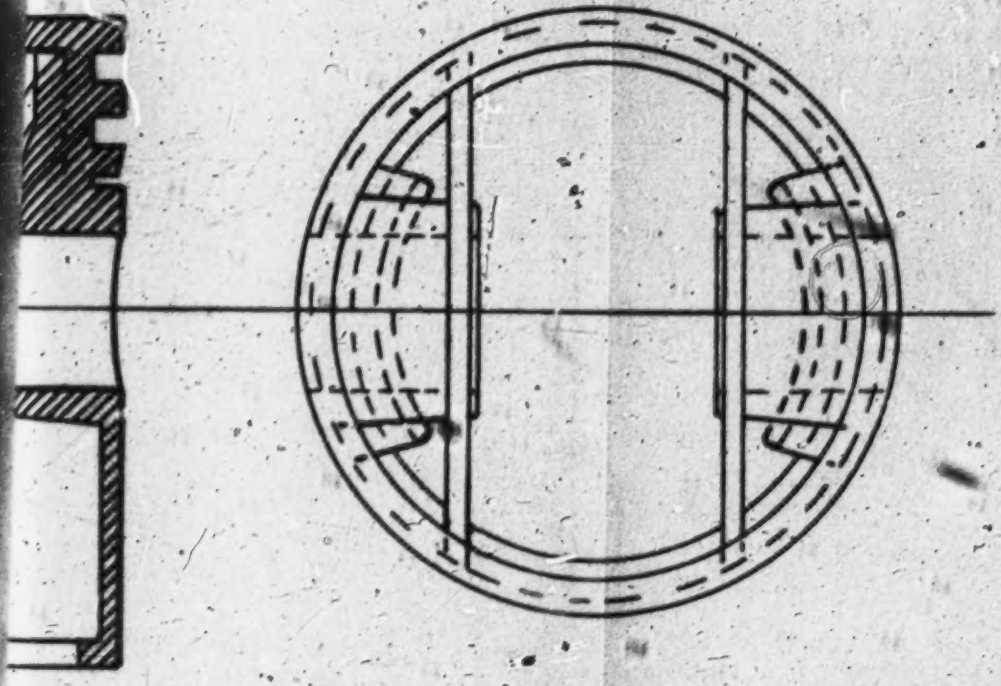
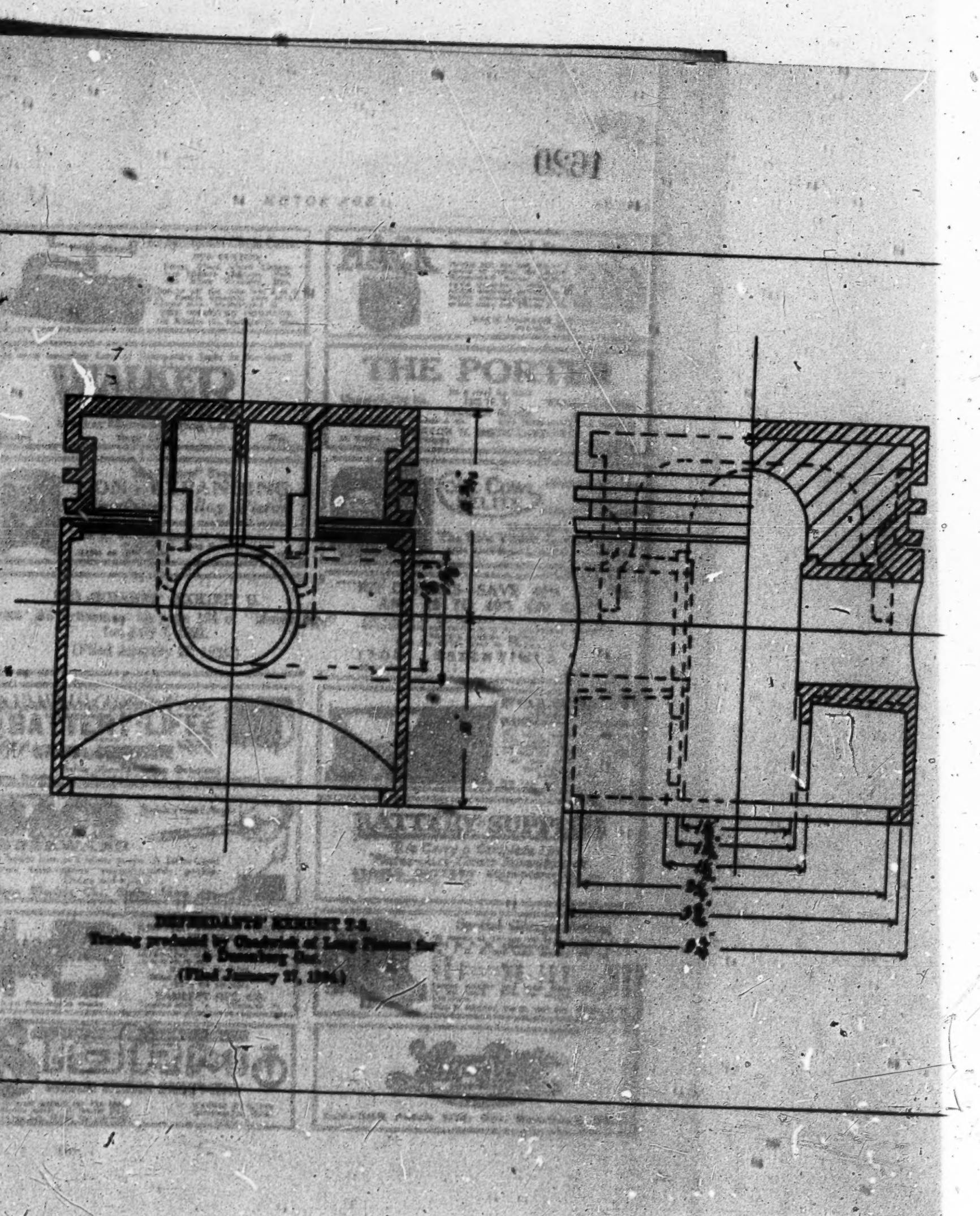
DEFENDANTS' EXHIBIT T-2.
Tracing produced by Chadwick of Long Pistons for an Essex Car.
(Filed January 27, 1934.)



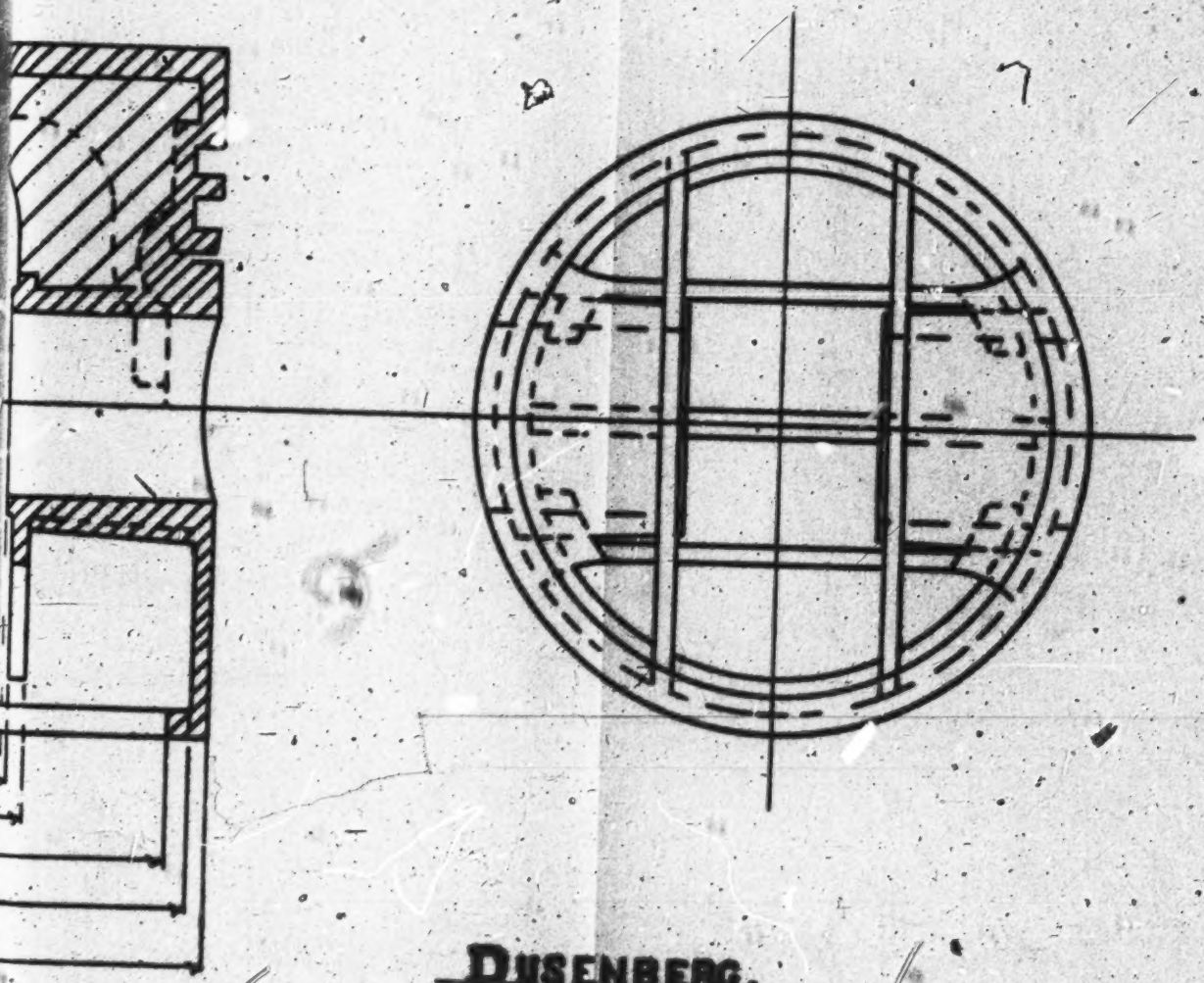
ESSEX



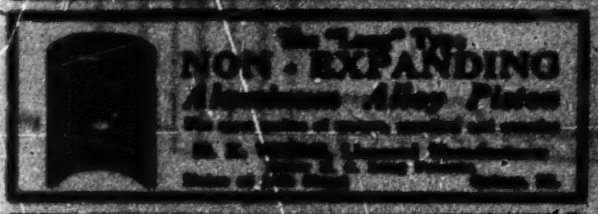
DEFENDANTS' EXHIBIT 2-A.
Tracing produced by Goodrich of Long Beacon for
a Doorsburg Suit.
(Filed January 27, 1936.)

1619

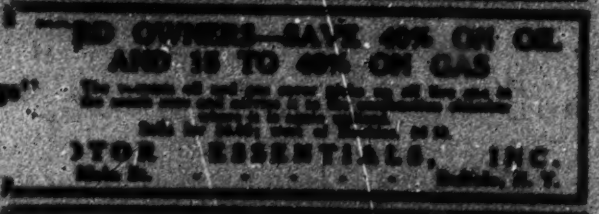
T3

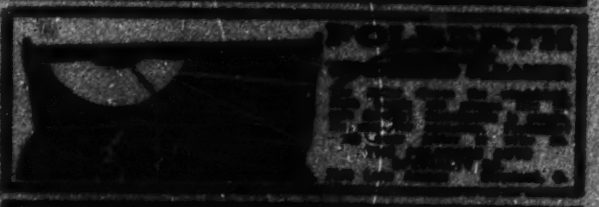


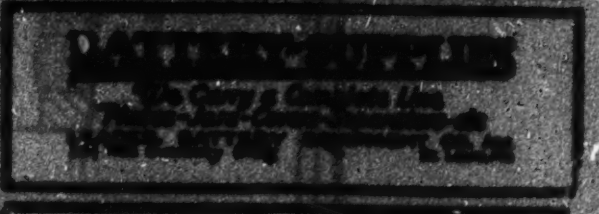
DUSENBERG.

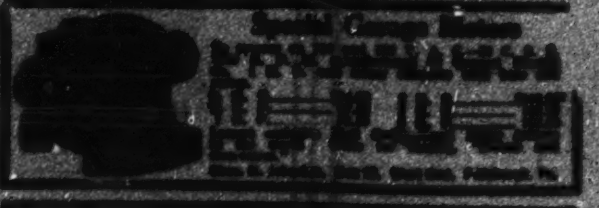


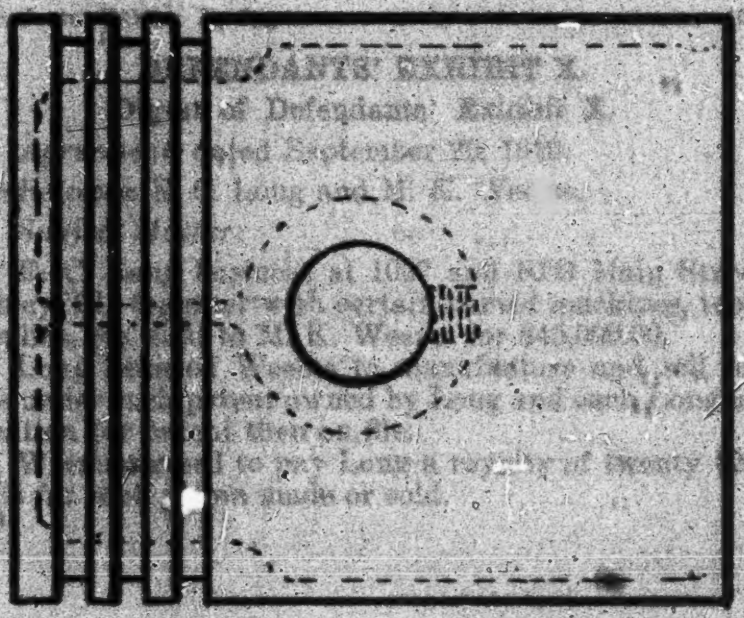
DEFENDANTS' EXHIBIT U.
Weaver Advertisement on page 124 of "Motor Age"
for July 7, 1934.
(Filed January 27, 1936.)

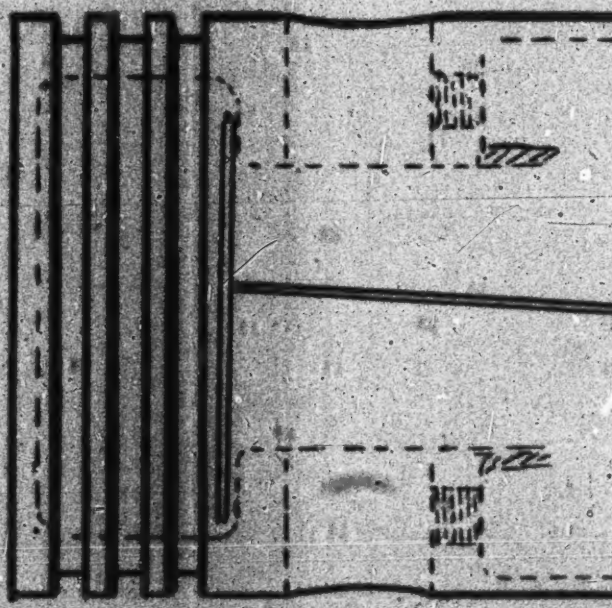




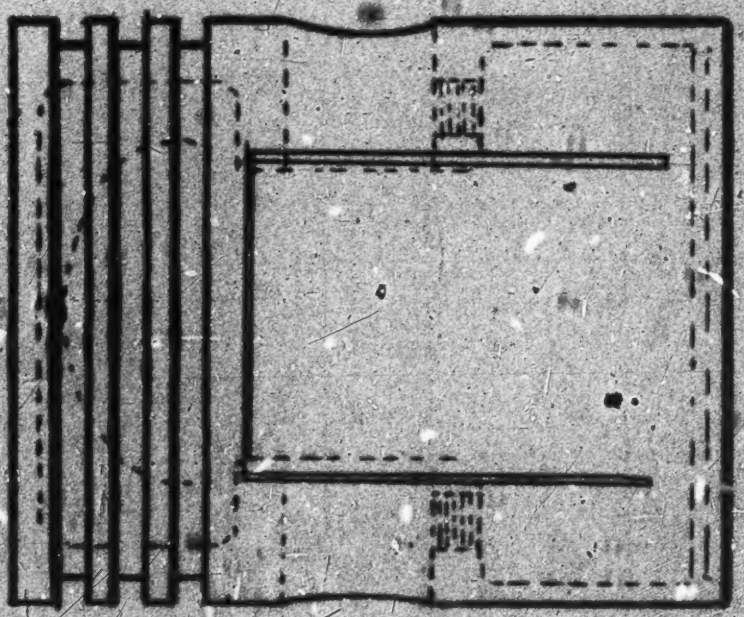


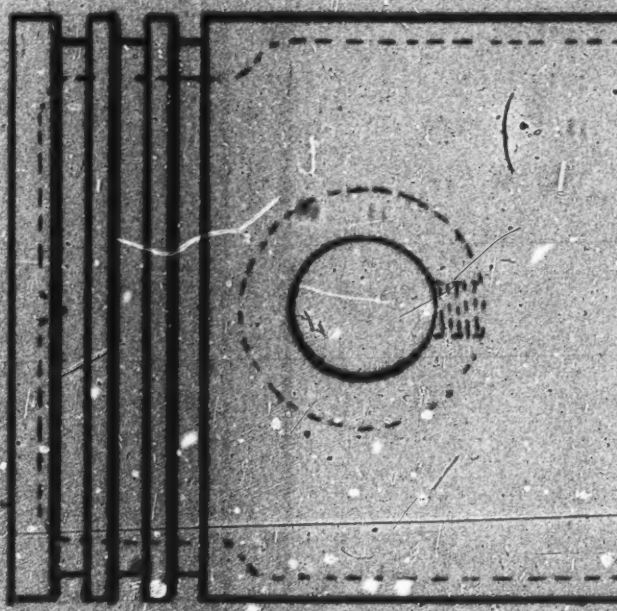


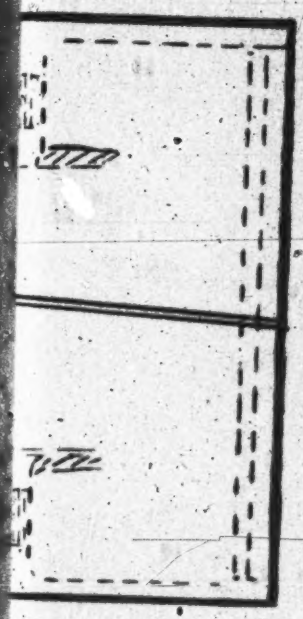


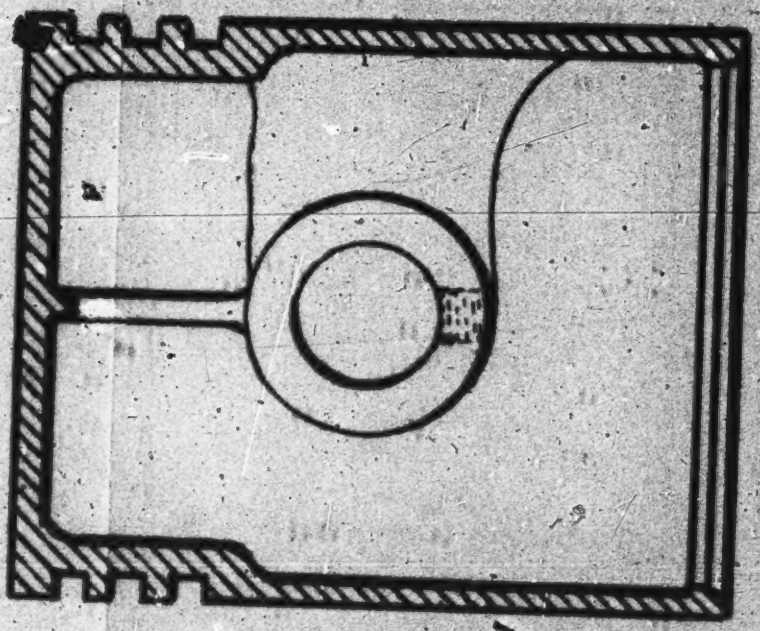


DEFENDANTS' EXHIBIT W.
Photostat of Trunk Piston added to by Chadwick to show T-slot Long Piston.
(Filed January 27, 1934.)









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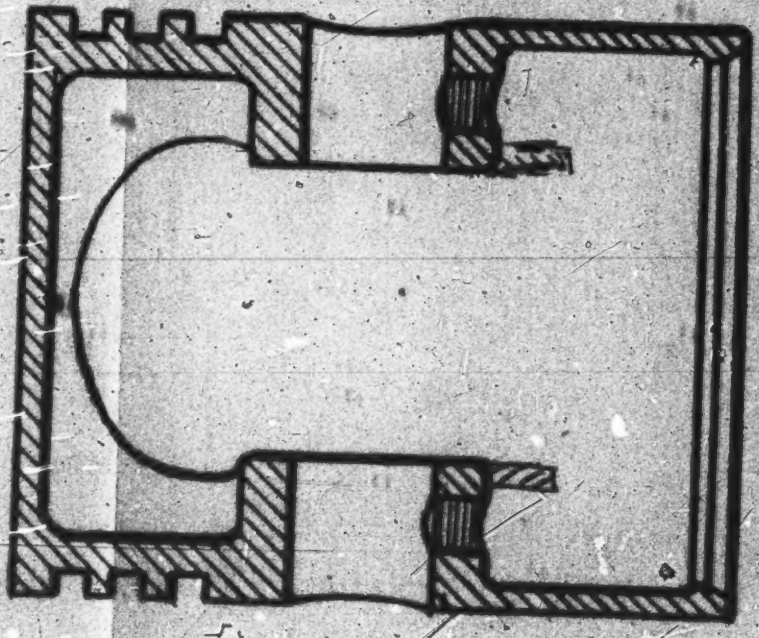

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DEFENDANTS' EXHIBIT X.

Digest of Defendants' Exhibit X.

Agreement, dated September 20, 1919.

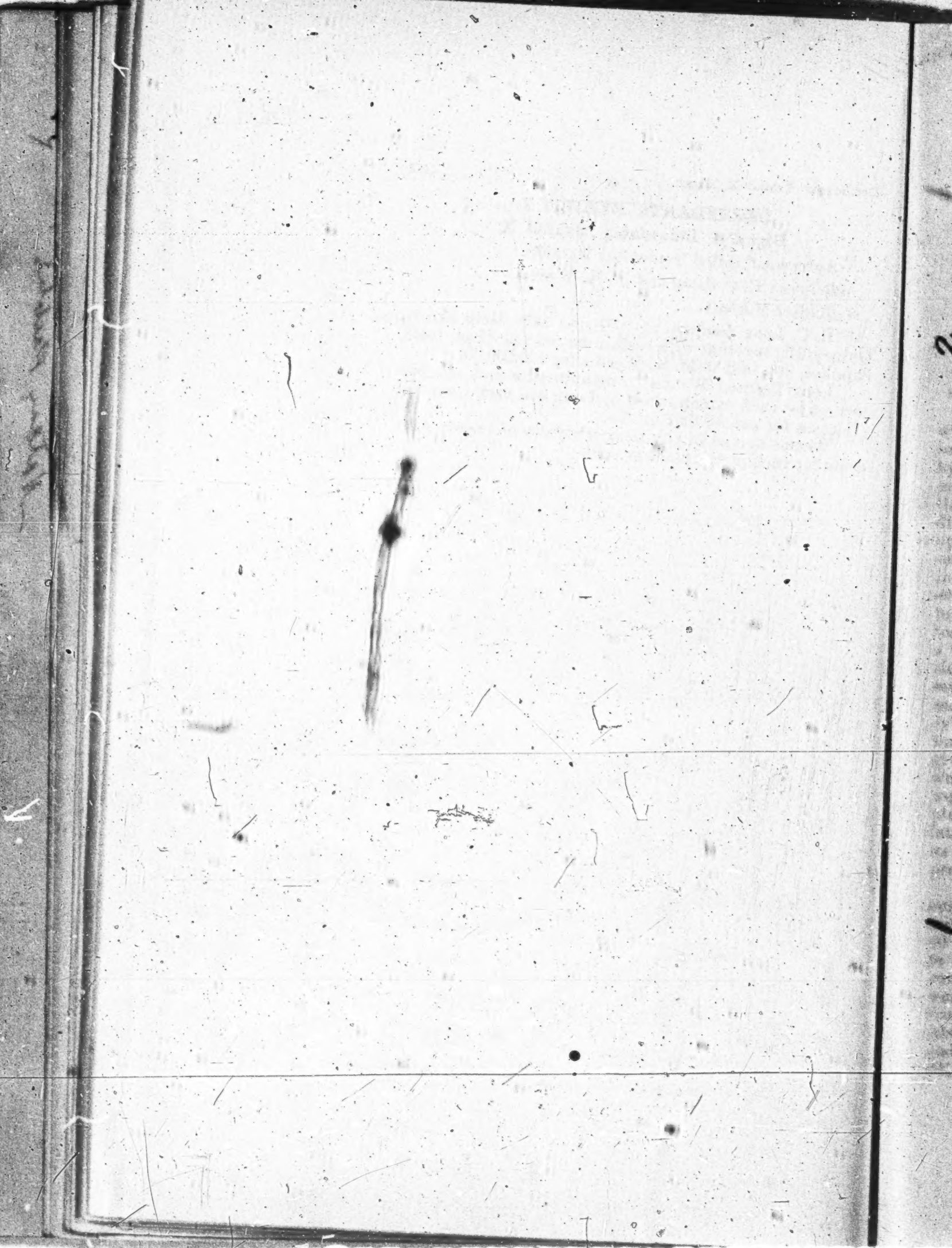
Between E. C. Long and M. K. Weems.

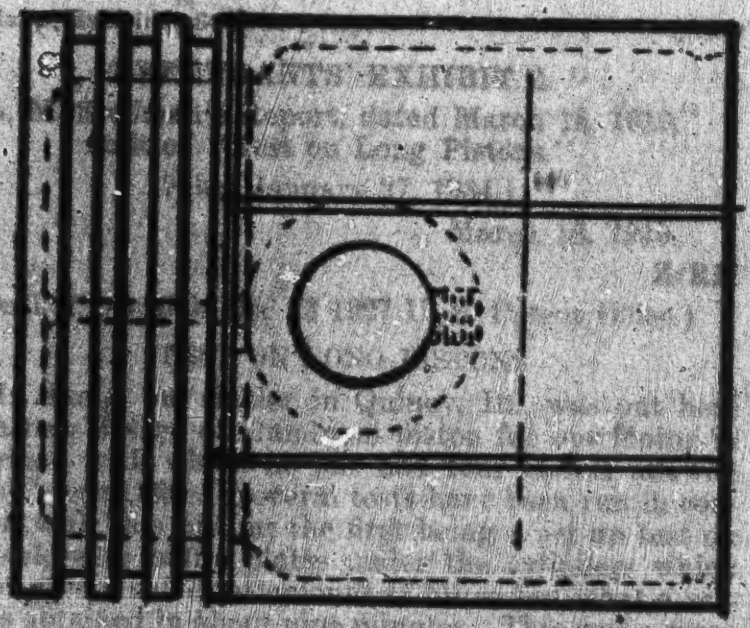
Subject Matter:

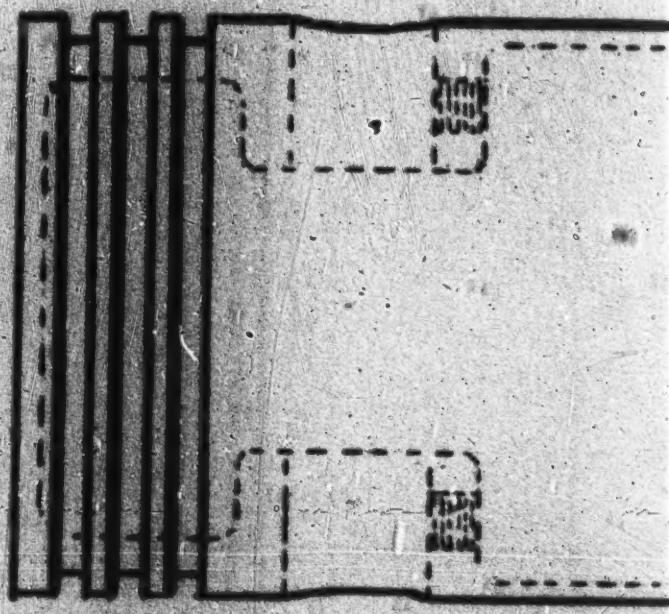
E. C. Long business at 1037 and 1039 Main Street, Quincy, Ill., together with certain named machines, tools, supplies, etc. sold to M. K. Weems for $45,000.00.

Long licensed Weems to manufacture and sell pistons under each patent owned by Long and each Long application for patent then on file.

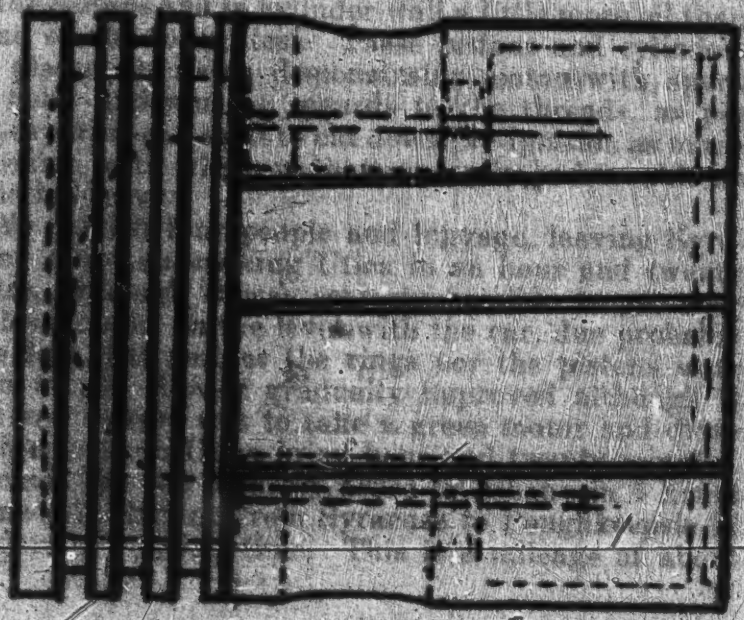
Weems agreed to pay Long a royalty of twenty (20) cents for each piston made or sold.

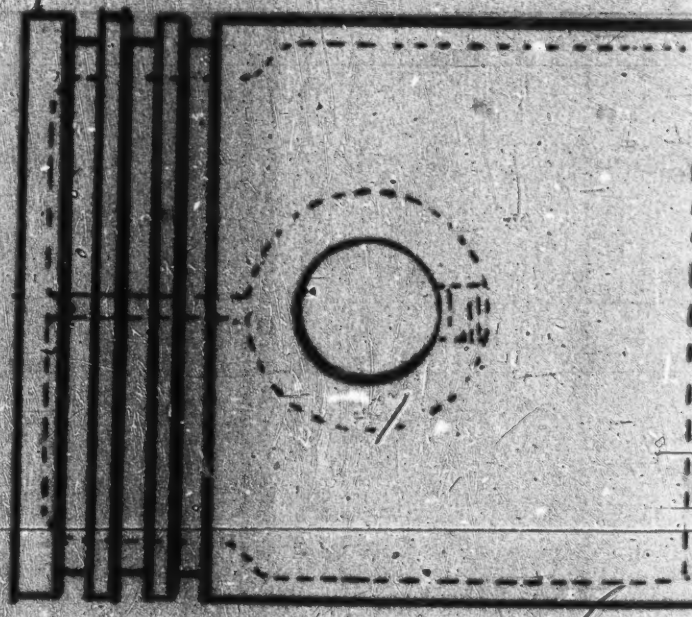


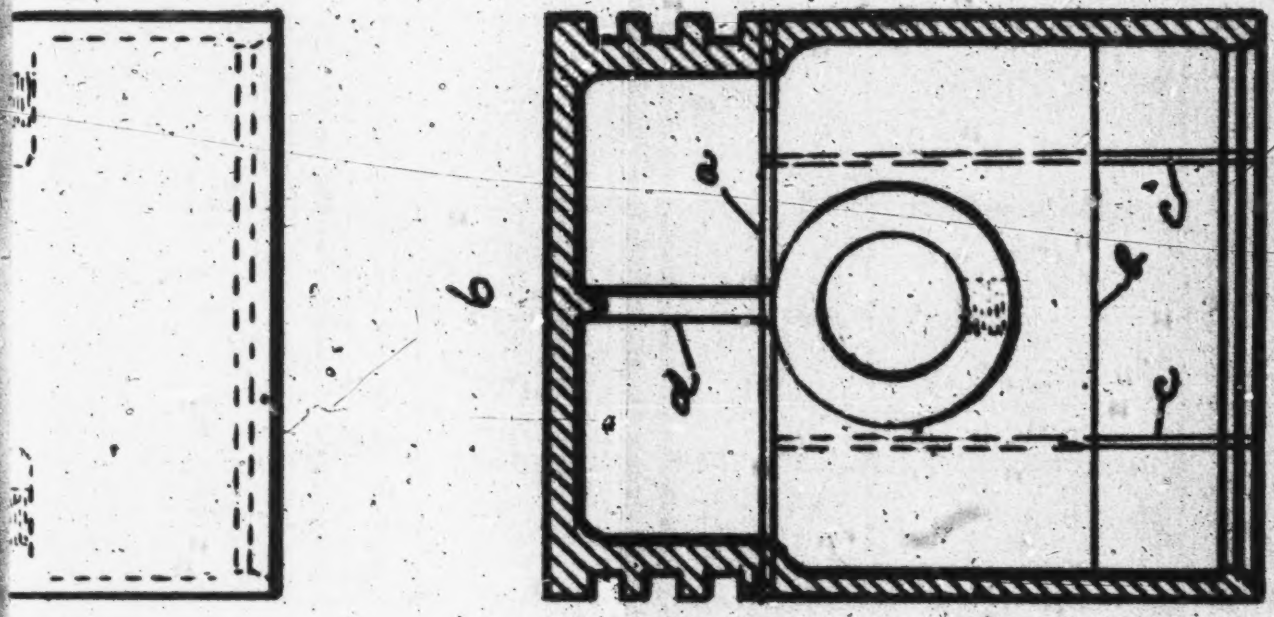


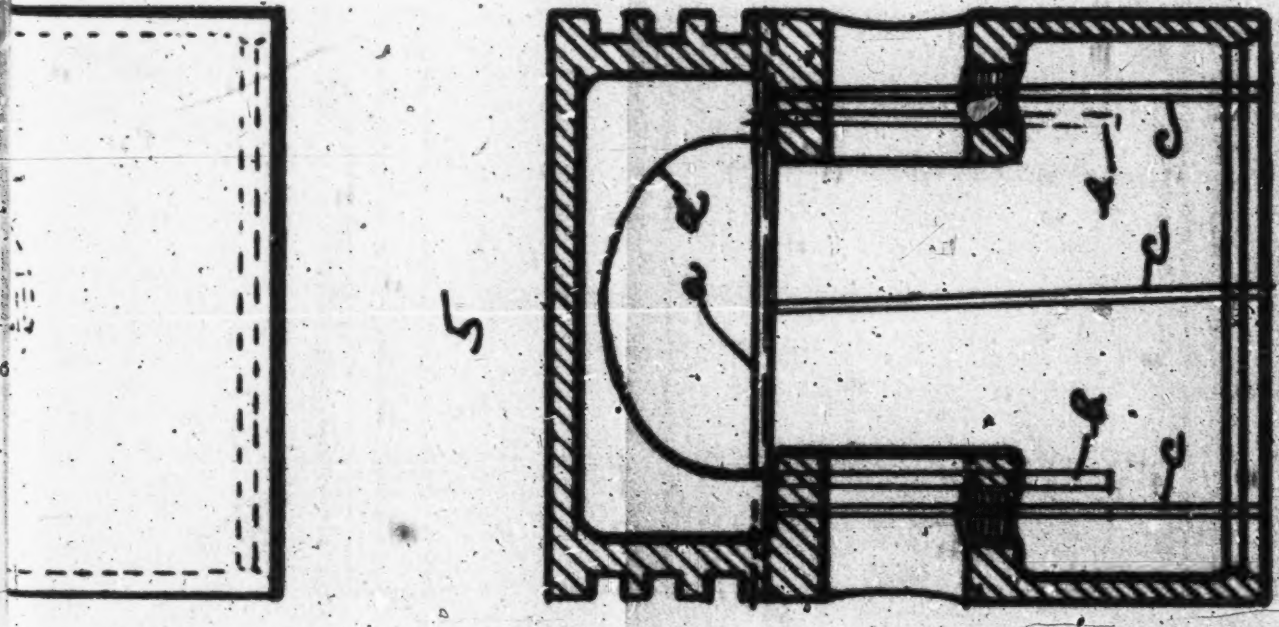


DEFENDANTS' EXHIBIT Y.
Photostat of Drawing by Stellman, Long 1916 Piston.
(Filed January 27, 1934.)









DEFENDANTS' EXHIBIT Z.

L. M. Stellman's Report, dated March 18, 1919, entitled "Test on Long Pistons."

(Filed January 27, 1934.)

March 18, 1919.

Z/RM

(Docket Division Dec 23 1927 U. S. Patent Office.)

TEST ON LONG PISTONS

Mr. Long, our dealer in Quincy, Ill., was out here with a new design of aluminum piston for our motor in connection with which he has had four claims allowed by the Patent Office. Several tests have been run in connection with this piston; the first being a set-up test on the block with baffle plates under the cylinders which did not give a sufficient amount of oil so but what a set-up was obtained in about nine minutes. This was a more severe test than we ordinarily give our regular production piston such as we are now using, and it is doubtful even if the pistons were undercut as we recommend them to be for use in the southwest would stand up under this test any longer than these pistons did. There was also a tendency toward too little oil. After this test, we decided to put these pistons on the road in a motor and consequently Mr. Long and the writer started out with a sedan equipped with new pistons, new rings and new cylinders which had never been run in together, the pistons having oil grooves cut circumferentially so as to give the pistons and ~~in~~ cylinder wall a little more oil than we had on the set-up test. These pistons and cylinders were placed on sedan demonstrator motor with spark plug holes undercut as regards to the threads, as per latest experiments, so as to cut down pre-ignition as much as possible, with which we have recently had trouble on production cars.

We carried four people and luggage, leaving Syracuse at 2:30 p.m., making Utica in an hour and twenty minutes, although it was scarcely possible to get over 40 miles an hour on the level with the car, due probably to the fact that neither the rings nor the pistons were run in at all. Power gradually improved although it was a very severe test to take a green motor and drive from Syracuse to Utica in an hour and twenty minutes. Also made the run from Syracuse to Albany in 4 hours and one-half, driving from Syracuse to Poughkeepsie in 6¾ hours of running time. This is a mileage of about

240 miles. During this comparatively high speed, the car got so it would hold 45 miles on the level continuously. One quart of oil was consumed in the total 240 miles. This oil consumption is very low, considering the speed which the car made. It has been the writer's experience that a normal production car would consume approximately one gallon of oil under the same conditions.

The run was continued to New York the next day where a day was spent at the Aeronautical Show. The next morning the oil was drawn off from the engine base, washed out, new oil put in, and we left Columbus Circle at 9 a.m., driving up through Connecticut, through Bridgeport, New Haven to Hartford, making 125 miles in 3½ hours. On this run, there was considerable comparatively level straight road and the car would hold 50 miles an hour against a slight head wind. During this run the Franklin kept ahead of a Cadillac coupe which was evidently bent on beating us to Hartford. After reaching Hartford, it was decided that it was practically impossible to set this car up under normal conditions on the level under temperatures encountered which were fairly cool, even though hot air was used both on suction yoke manifold and carburetor intake. Therefore we decided to take the car up into the Vermont hills through mud roads. We drove the car 120 miles on low and second gear work over roads that were axle deep with mud, so deep that we scraped the flywheel boot off. While it was possible to get the motor to pre-ignite so that the engine would lose power badly and it would be necessary to drop into a lower gear; as soon as this was done, the engine speed was allowed to pick up, pre-ignition would disappear and the motor would run apparently in excellent shape. With regular production motor or cast iron pistons if pre-ignition was obtained as it was in this car, the motor would, in the writer's opinion set up when shifted to lower gear and speed increased. During this 120 mile drive in the mud, sedan was carrying one thousand pounds dead load. The remainder of the trip was completed back to Syracuse over the Mohawk trail, coming up the long grade on the east side of Hoosick Mountain with about 3" of soft snow. The whole grade was negotiated in second gear except when the pre-ignition got so great that it was necessary to drop into low gear for a short period of time. The last 150 miles was run in 4¼ hours running time. The total oil consumption from the time we left New York, during all our low and

second gear and hard work, was at the rate of 680 miles to the gallon.

From this test it would look as if it might be desirable to change the baffle plates slightly from those used on this motor so as to allow the motor to use more oil at low speeds. The gasoline consumption for the total 970 miles averaged 15 miles to the gallon which would seem to be very good considering the speed and the condition of the roads. It seems to the writer as if this piston was operating satisfactorily and would run in a perfectly satisfactory manner. The only question would be as to how the performance in regard to pre-ignition and loss of power would be in the southwest where the temperatures encountered are considerably higher. On examining the pistons after the motor was torn down, there was no trouble encountered with scores or roughness on the piston, but the cylinders were slightly scored in a vertical direction. This probably was due to starting the motor out and running under extremely hard conditions without first running pistons and cylinders together.

L. M. Stellman.

DEFENDANTS' EXHIBIT AA.

Digest of Defendants' Exhibit AA.

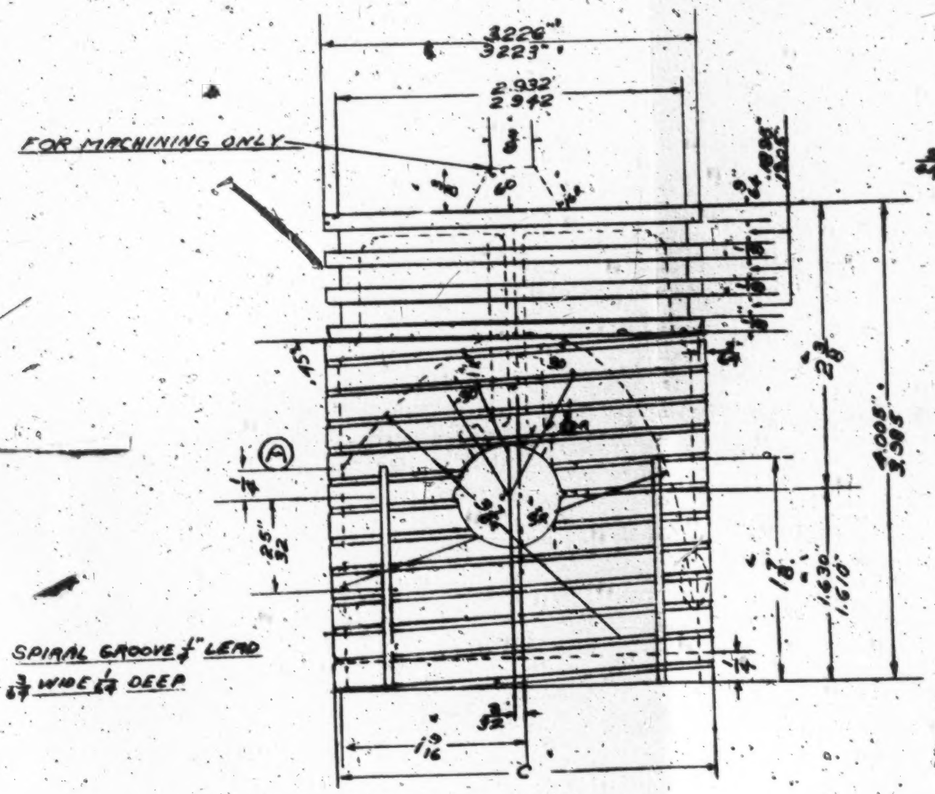
License Agreement, dated March 20th, 1919.

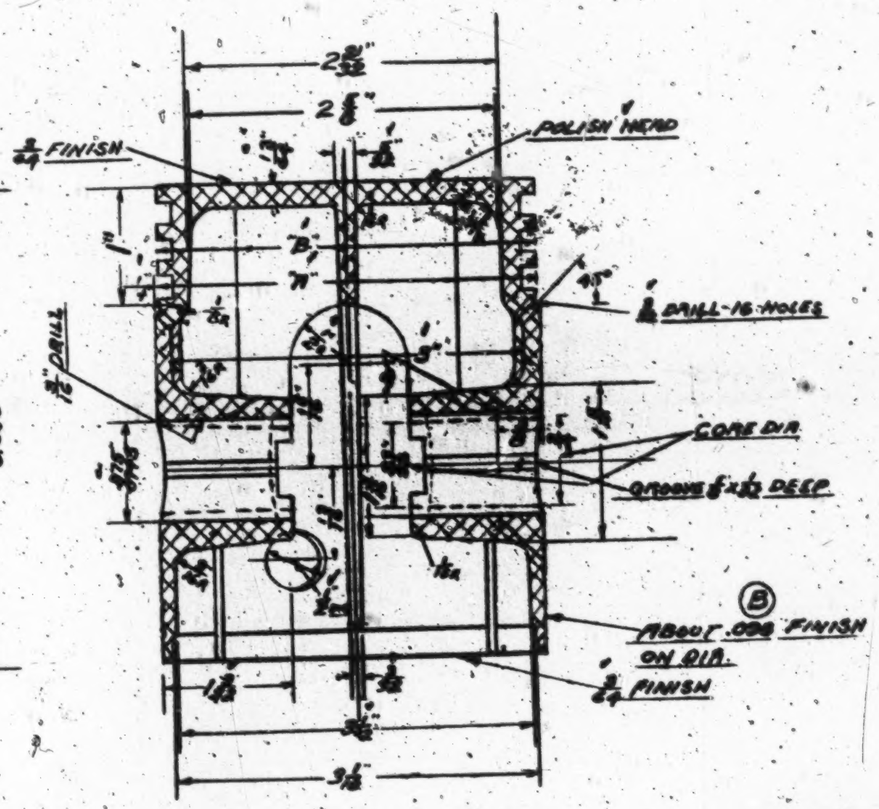
Between Elmer C. Long of Quincy, Illinois, and the H. H. Franklin Manufacturing Company, of Syracuse, New York.

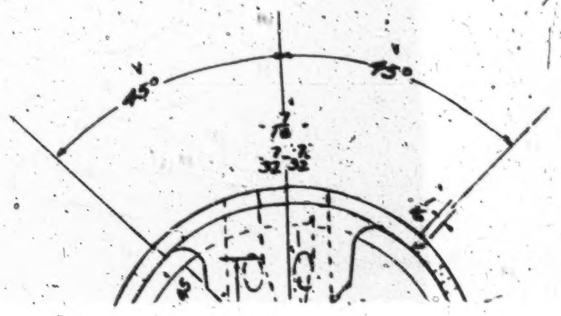
Subject Matter:

Elmer C. Long grants a non-exclusive license to the Franklin Company under Long Application for Patent, Serial No. 281,175 and under all patents and applications owned or thereafter acquired by Long.

The Franklin Company agrees to pay Long a royalty of twenty (20) cents for each of the first thirty thousand (30,000) pistons made and sold, fifteen (15) cents for each of the next thirty thousand (30,000) pistons made and sold, and ten (10) cents for each piston made and sold thereafter.

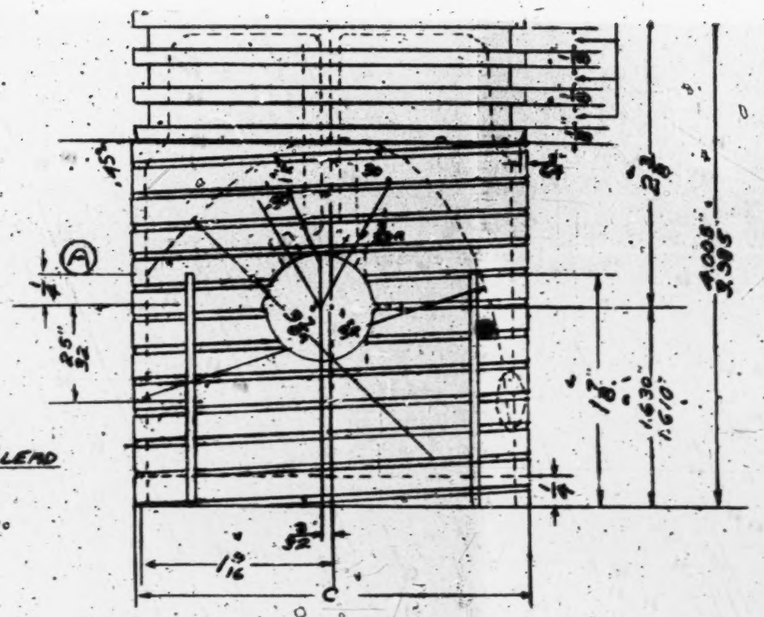


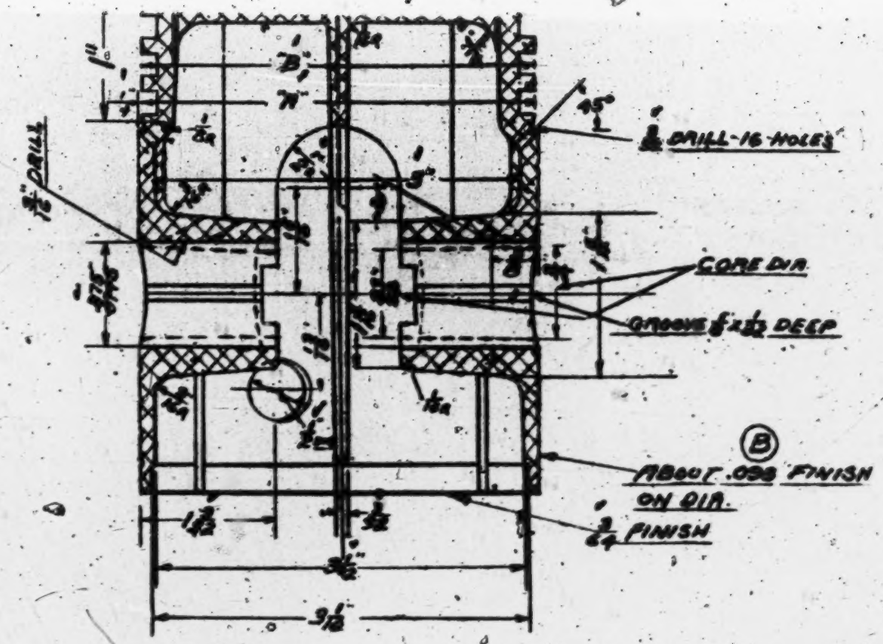


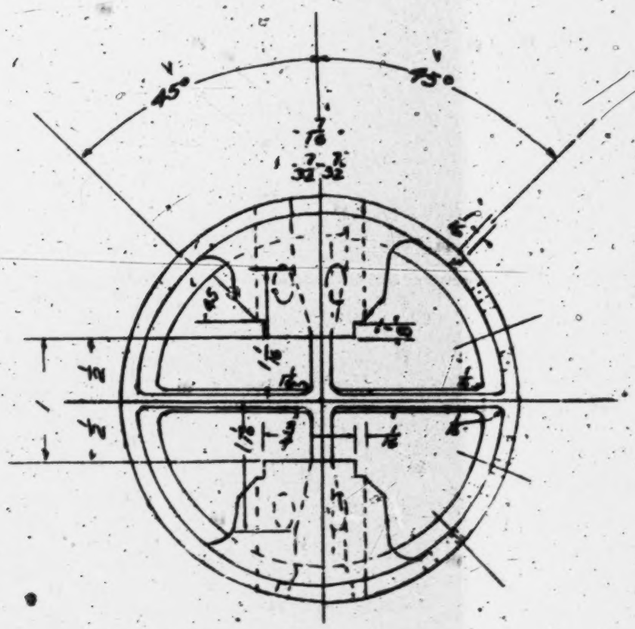


GRIND PISTON "A" OF SUCH SIZE THAT WHEN ASSEMBLED WITH CYLINDER CLEARANCE WILL BE .018"
GRIND "B" WITH .01 CLEARANCE TAPERING TO .002" AT "C"
NOTE CYLINDER BORE .3230"
ALL PISTONS ON SAME MOTOR MUST BE SAME WEIGHT

HEAT TREATED AND BRINELL 60 to 70







GRIND PISTON "A" OF SUCH SIZE THAT WHEN ASSEMBLED WITH CYLINDER CLEARANCE WILL BE .018"
GRIND "B" WITH .011 CLEARANCE TAPERING TO .002" AT "C"
NOTE CYLINDER BORE 3.250"/3.251"
ALL PISTONS ON SAME MOTOR MUST BE SAME WEIGHT

HEAT TREATED AND BRINELL 80±10

122-5

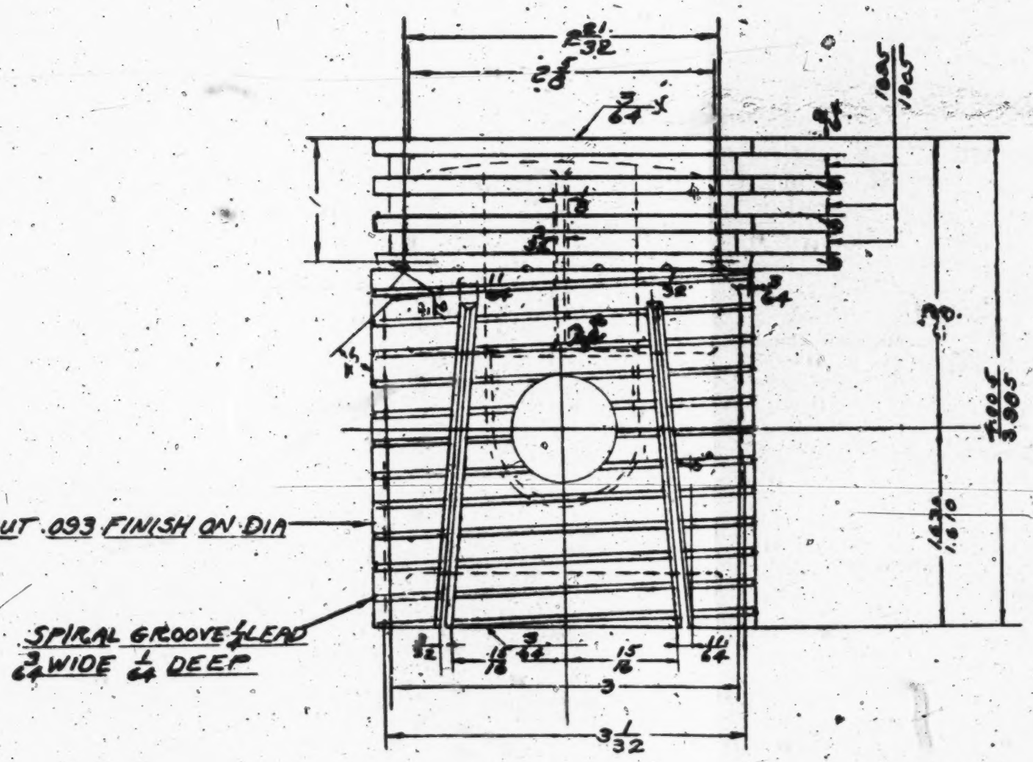
REVISIONS	A	B	C	D	E	F	G
PREVIOUS	#18 CHROME	066					
CHANGED	8-26-33	8-26-33					
TO	1/4"	.039					
SEE	FINISH PRINT	FINISH PRINT					

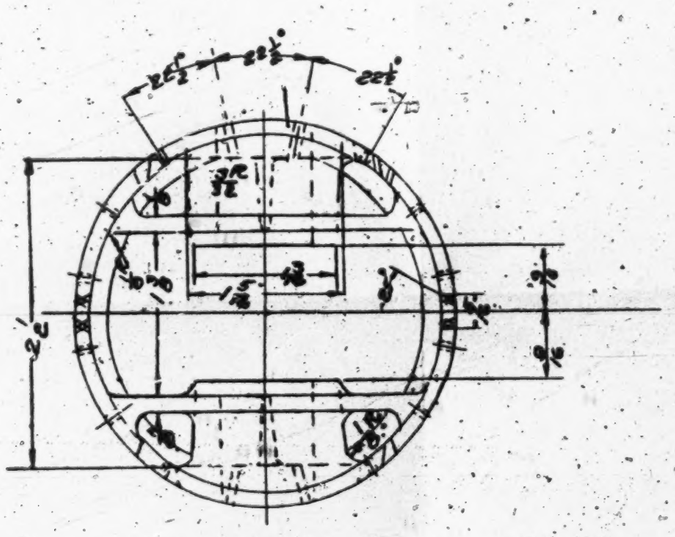
—NOTE—
DO NOT SCALE THIS BLUEPRINT
TOLERANCES ON ALL FINISHED DIMENSIONS TO BE ±0.010 OF AN INCH UNLESS OTHERWISE SPECIFIED

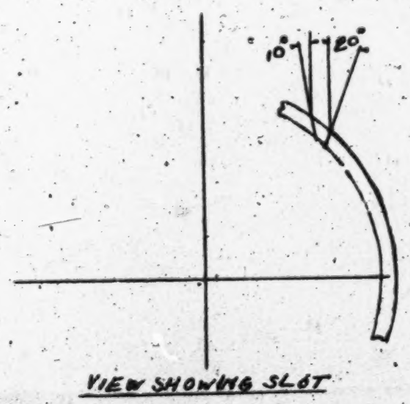
DATE FEB 11 1933 | SCALE 1"=1"
ROUGH WEIGHT | FINISHED WEIGHT
DESIGNED BY | MATERIAL LYNITE-ALLOY
DRAWN BY E.H.M. | CHECKED BY Bentley
APPROVED J.H. Bentley

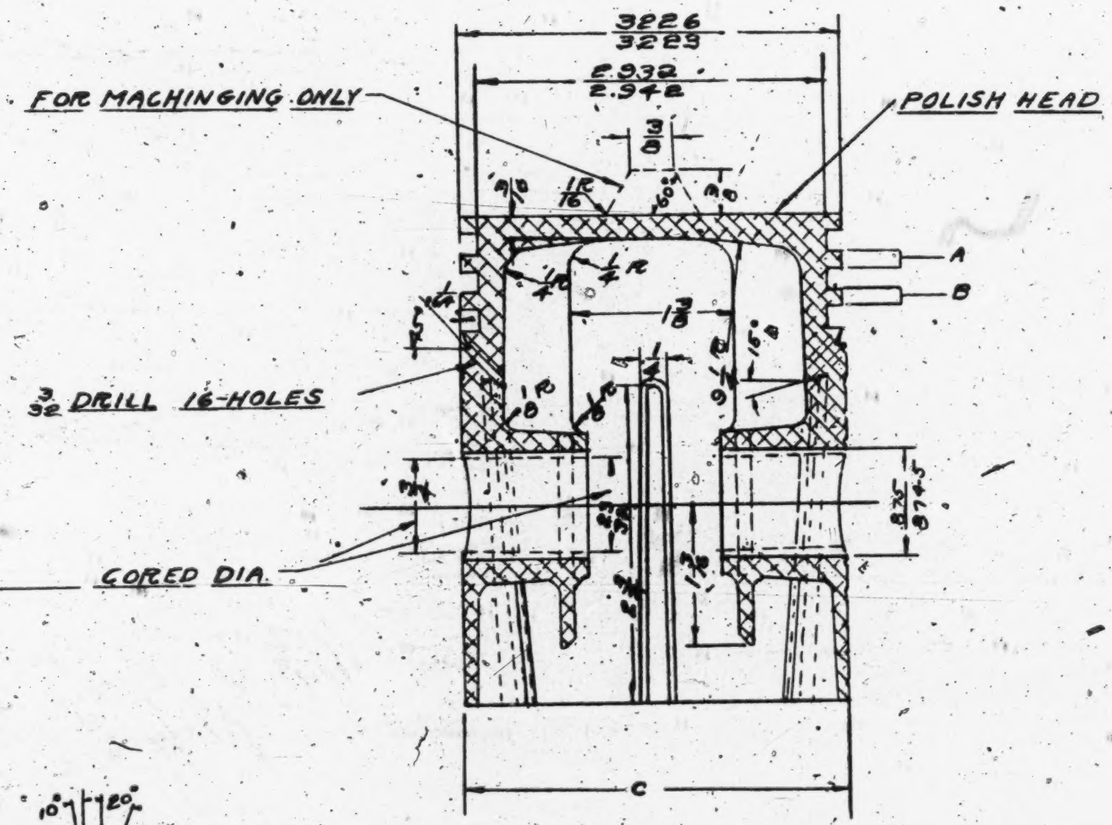
THE ALUMINUM CASTINGS CO.
CLEVELAND, OHIO
DRAWING OF
PROPOSED DESIGN OF PISTON
FOR H.H. FRANKLIN MFG. CO.
PLANT N | DRAWING NUMBER D-793X

DEFENDANTS' EXHIBIT OO'(1).
Blueprint D-793X of The Aluminum Castings Co. (Drawing of Proposed Design of Piston for H. H. Franklin Mfg. Co.
(Filed January 27 1934.)

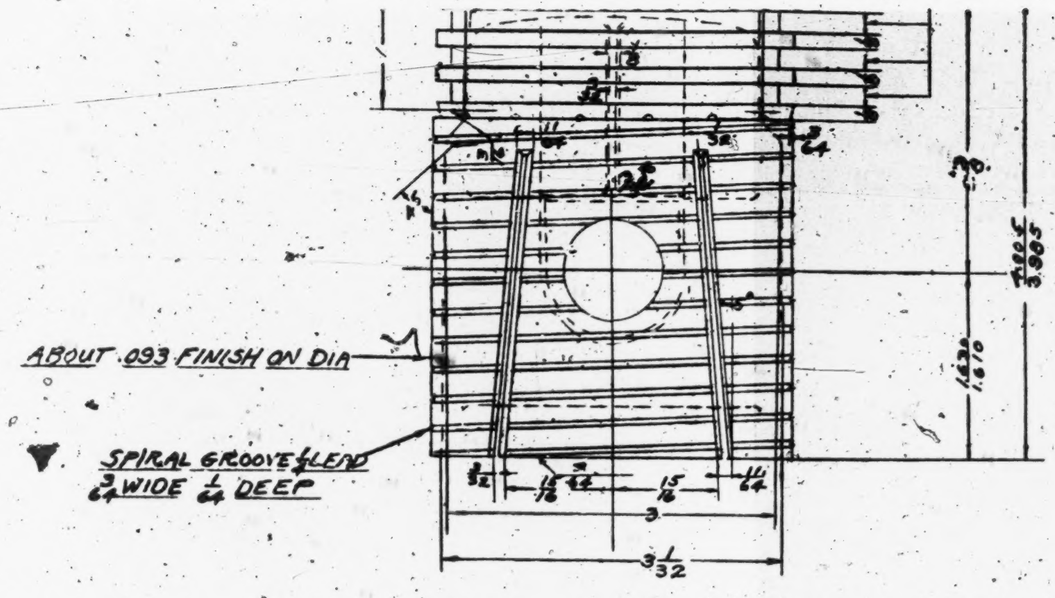


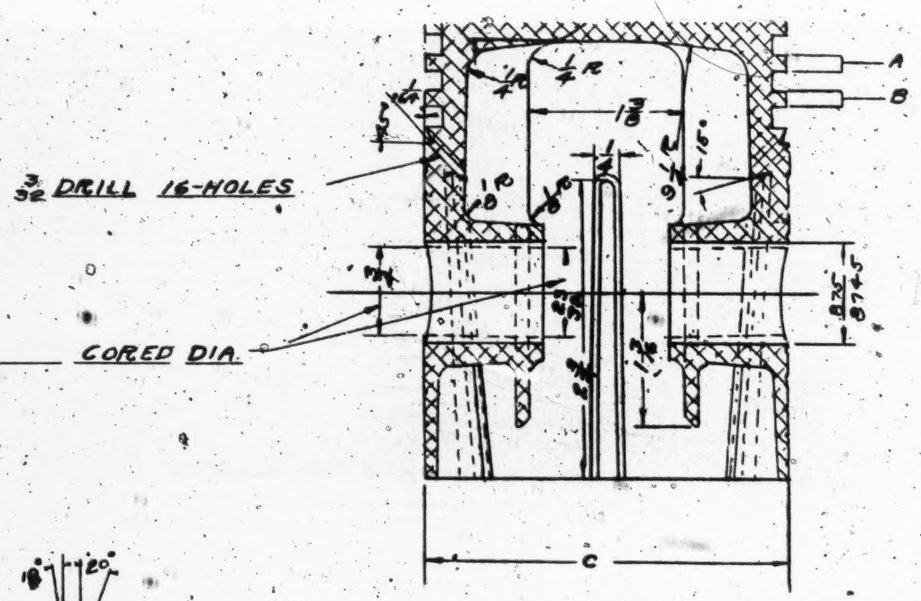


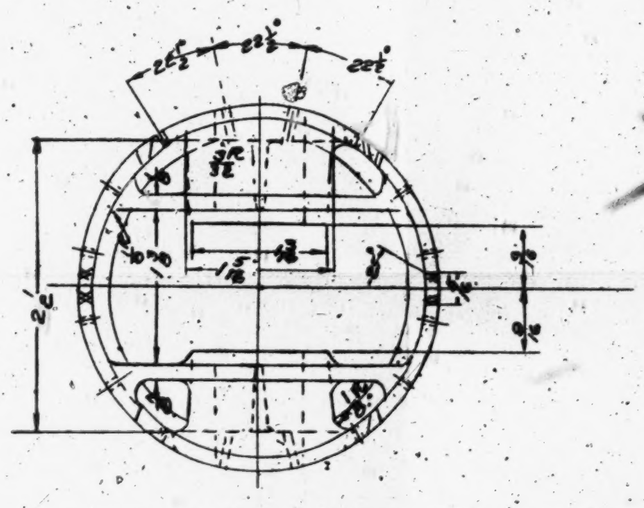




GRIND PISTON A OF SUCH SIZE THAT WHEN ASSEMBLED WITH CYLINDER CLEARANCE WILL BE .018
GRIND B WITH .010 CLEARANCE TAPERING TO .008 AT C
NOTE - CYLINDER BORE 3260 / 3261
ALL PISTONS ON SAME MOTOR MUST BE SAME WEIGHT
HEAT TREATED AND BRINELL 60 TO 10







VIEW SHOWING SLOT

GRIND PISTON A OF SUCH SIZE THAT WHEN ASSEMBLED WITH CYLINDER CLEARANCE WILL BE .018
GRIND B WITH .018 CLEARANCE TAPERING TO .008 AT C
NOTE - CYLINDER BORE 3.260 / 3.251
ALL PISTONS ON SAME MOTOR MUST BE SAME WEIGHT
HEAT TREATED AND BRINELL 200 / 210

GD-23

DEFENDANTS' EXHIBIT GG (2).
Blueprint D-944X of The Aluminum Castings Co. (Drawing of Proposed Design of Piston for H. H. Franklin Mfg. Co.)
(Filed January 27, 1934.)

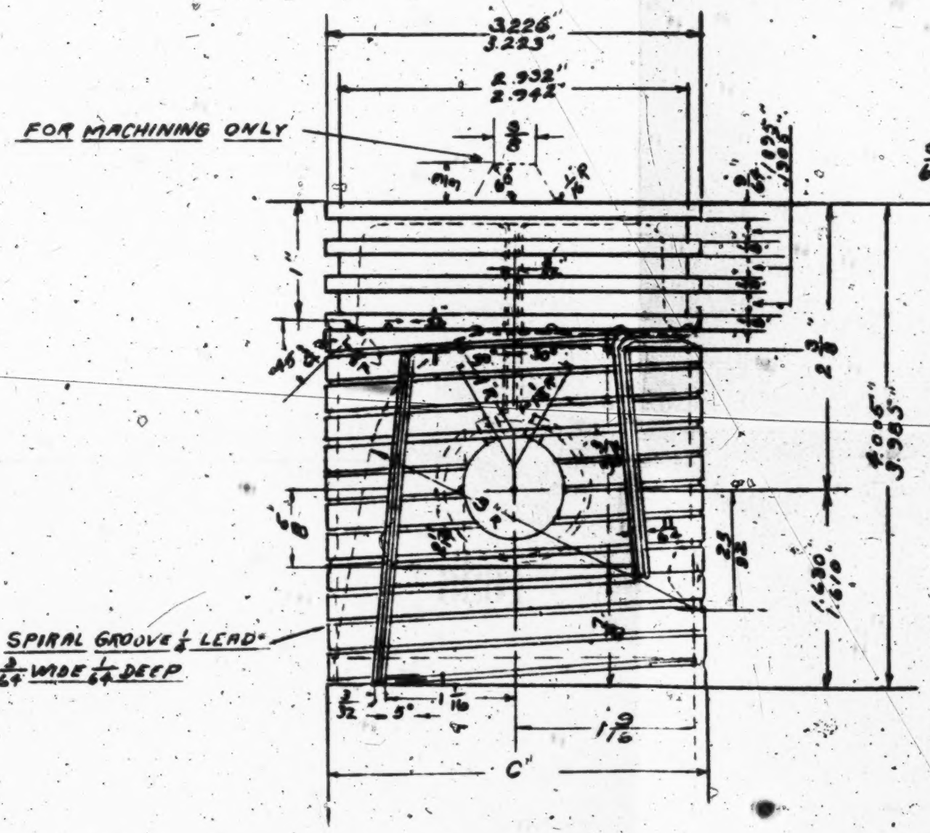
REVISIONS	A	B	C	D	E	F	G
PREVIOUS							
CHANGED							
TO							
SEE							

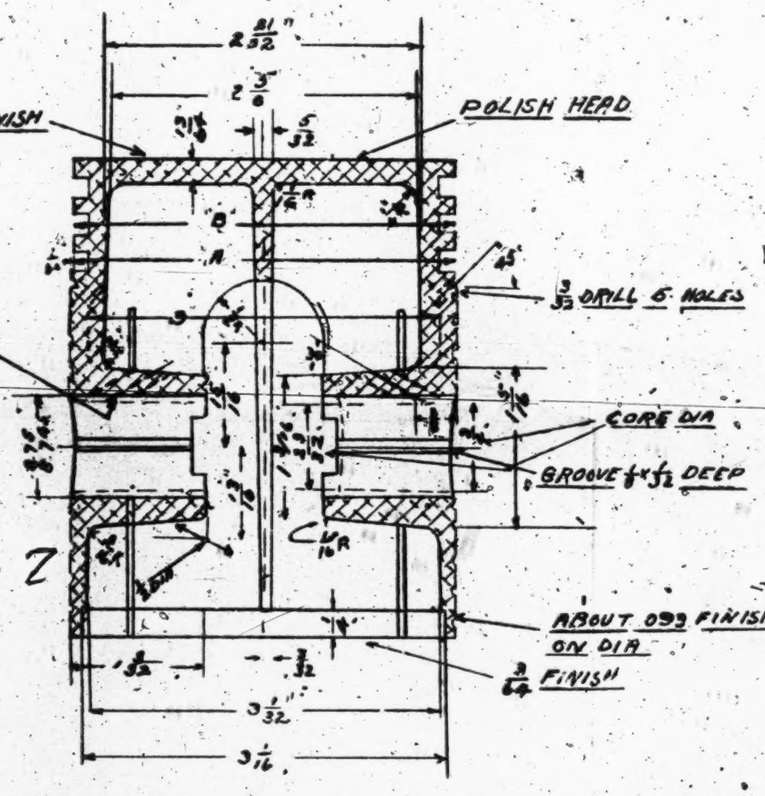
THE ALUMINUM CASTINGS CO.
CLEVELAND OHIO.
DRAWING OF
PROPOSED DESIGN OF PISTON
FOR HH FRANKLIN MFG CO.
CUSTOMERS' DRAWING

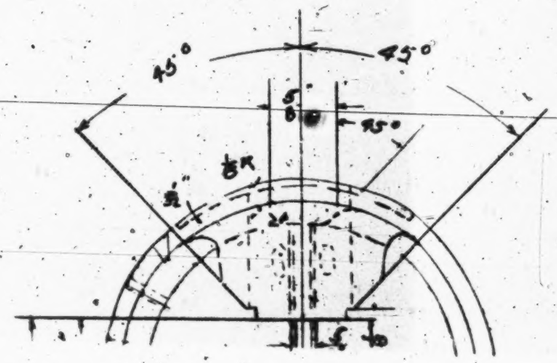
—NOTE—
DO NOT SCALE THIS BLUEPRINT
TOLERANCES ON ALL FINISHED DIMENSIONS TO BE ±0.010 OF AN INCH UNLESS OTHERWISE SPECIFIED

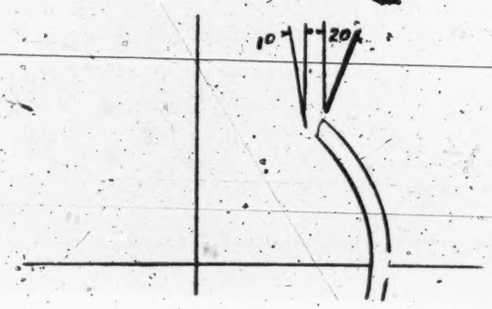
DATE MAY-6-1929 | SCALE 1" = 1"
ROUGH WEIGHT | FINISHED WEIGHT
DESIGNED BY | MATERIAL ALUMINUM
DRAWN BY [illegible] | CHECKED BY [illegible]
APPROVED [illegible]

PLANT N | DRAWING SYMBOL D-944X









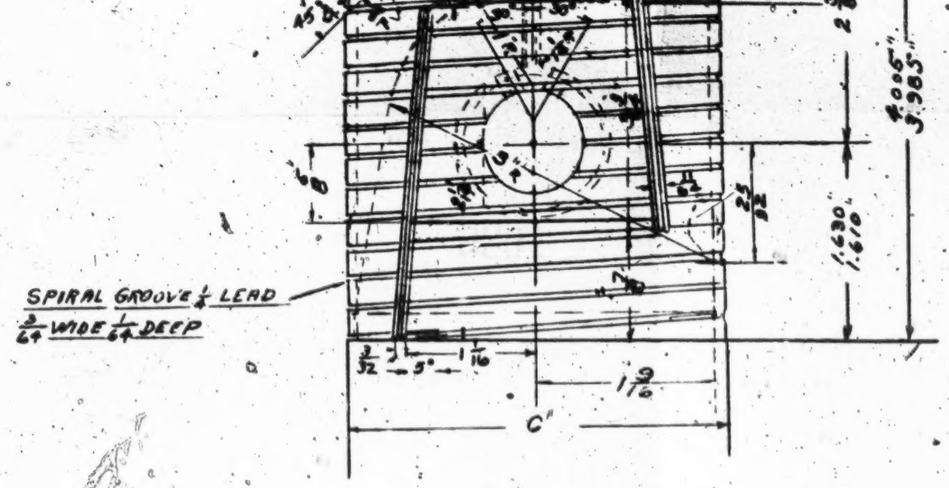
GRIND PISTONS OF SUCH SIZE THAT WHEN ASSEMBLED WITH CYLINDER CLEARANCE WILL BE .018

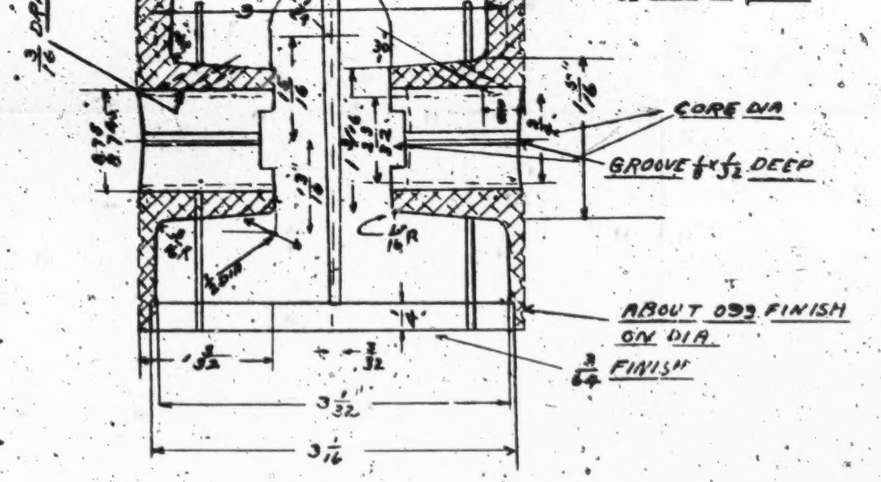
GRIND BOTTOM ON CLEARANCE TAPERING TO .002 AT "C"

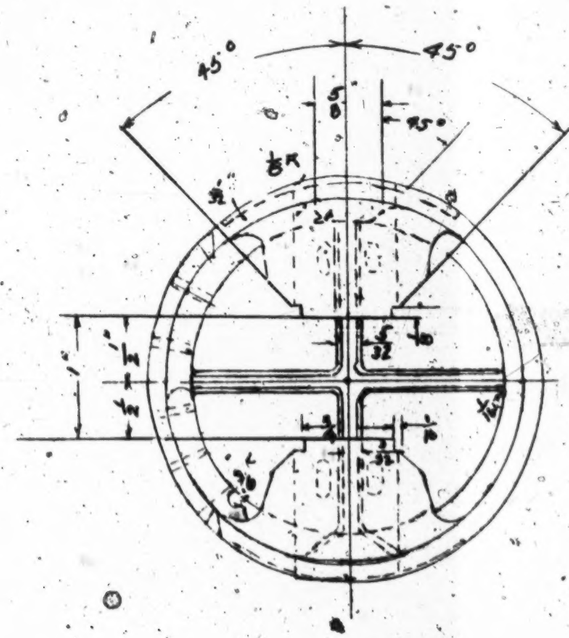
NOTE— CYLINDER BORE 3.250" / 3.251"

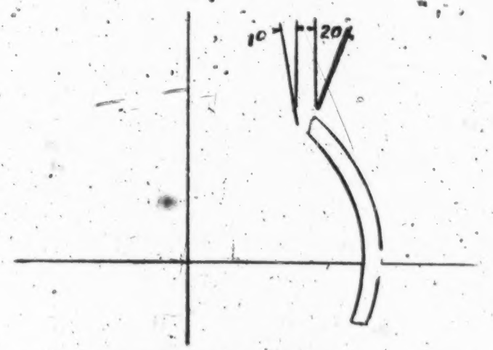
ALL PISTONS ON SAME MOTOR MUST BE SAME WEIGHT

HEAT TREATED AND BRINELL 80 TO 110









VIEW SHOWING SLOT

GRIND PISTON A OF SUCH SIZE THAT WHEN ASSEMBLED WITH CYLINDER CLEARANCE WILL BE .018
GRIND B WITH .011 CLEARANCE TAPERING TO 002" AT "C"
NOTE – CYLINDER BORE 3.250" / 3.251"
ALL PISTONS ON SAME MOTOR MUST BE SAME WEIGHT

HEAT TREATED AND BRINELL 80 TO 110

DEFENDANTS' EXHIBIT CC (3).
Blueprint D-960X of The Aluminum Castings Co. (Drawing of Proposed Design of Piston for H. H. Franklin Mfg. Co.)
(Filed January 27, 1934.)

REVISIONS	A	B	C	D	E	F	G
PREVIOUS							
CHANGED							
TO							
SEE							

–NOTE–
DO NOT SCALE THIS BLUEPRINT
TOLERANCES ON ALL FINISHED DIMENSIONS TO BE ±.010 OF AN INCH UNLESS OTHERWISE SPECIFIED

DATE May 24 1929
ROUGH WEIGHT
DESIGNED BY
DRAWN BY
APPROVED
SCALE 1" = 1"
FINISHED WEIGHT
MATERIAL LYNITE-MIRR
CHECKED BY

THE ALUMINUM CASTINGS CO.
CLEVELAND, OHIO.
DRAWING OF PROPOSED DESIGN OF PISTON
FOR H.H. FRANKLIN MFG CO.
CUSTOMERS DRAWING

PLANT	DRAWING SYMBOL
N	D-960X

DD.

Fig 1

Fig 2

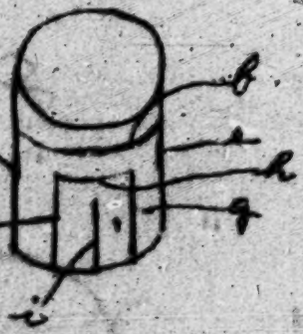


Fig 3

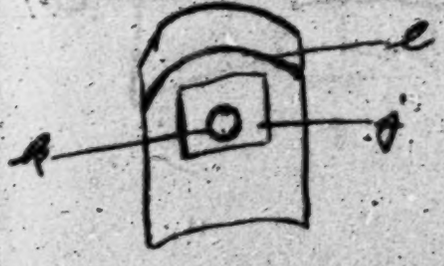
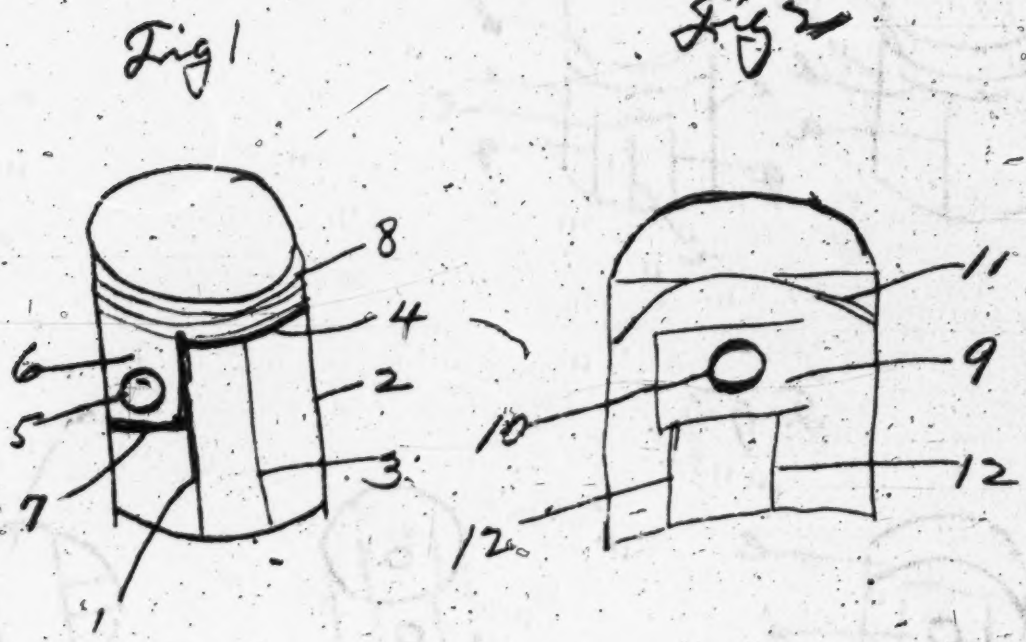


Fig 4

Fig 5

DEFENDANTS' EXHIBIT DD.
Sketch of Long Piston seen by Royalty in 1913.
(Filed January 27, 1934.)



DEFENDANTS' EXHIBIT EE.
Sketch of Long Piston by Royalty in February 1918.
(Filed January 27, 1934.)

Fig 3

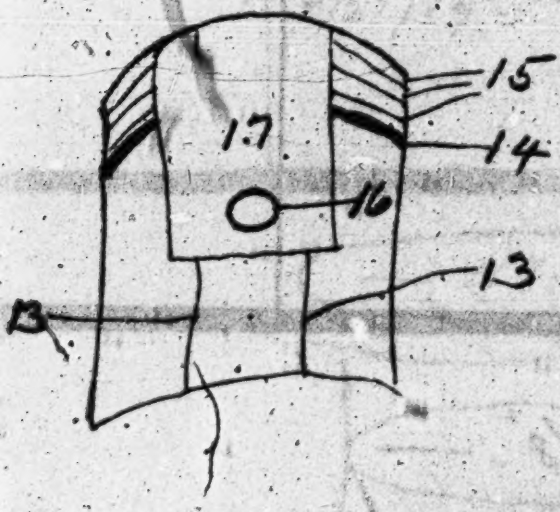
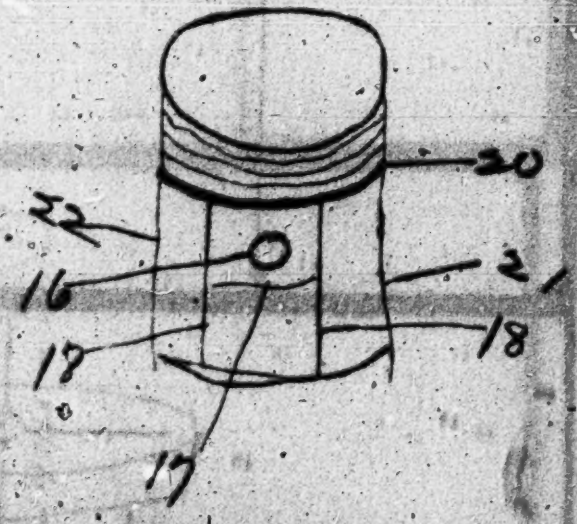


Fig 4



DEFENDANTS' EXHIBIT FF.
Sketch of Other Views of Piston shown in Exhibit EE.
(Filed January 27, 1934.)

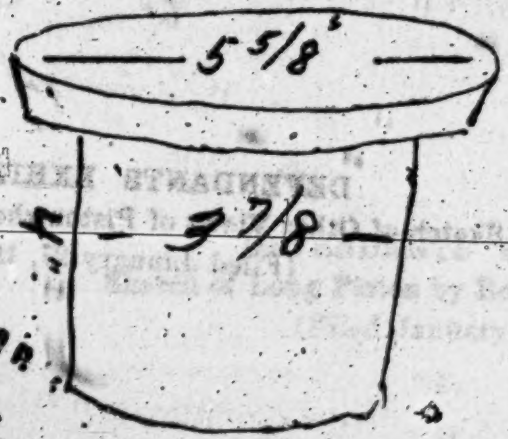
DEFENDANTS' EXHIBIT GG.
Photostat of Pattern Record Card marked D-8764.
(Filed January 27, 1934.)

FIRM P.O. NAME	ADDRESS
C. C. Lang Mfg. Co.	Gulick - Ex 31

PATT. NO.	DESCRIPTION	No. OF CORE BOXES	BIN No.
D8764		1	3981

SPECIAL IDENTIFICATION: 1 Wood

DATE RECEIVED	DATE RETURNED	DATE RECEIVED	DATE RETURNED
1/29/19	3/21/19 - 1 Wood - 1 C.B.		



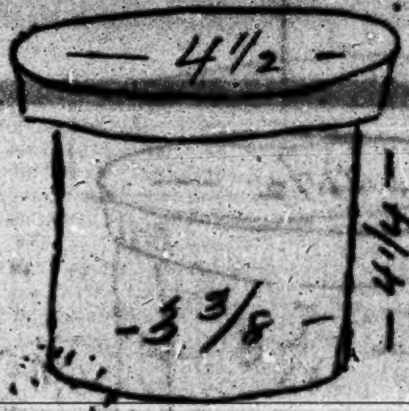
31-0

1/29/27 Order A.P.

NOTARY PUBLIC

FORM P-2 NAME	ADDRESS
E C Long Mfg Co	Orchard Ex 31
PAT. NO. 2240	DESCRIPTION: Wood - Gilbert.
SPECIAL IDENTIFICATION:	No. OF CORE RODS:	DIE NO.: 398

DATE RECEIVED	DATE RETURNED	DATE RECEIVED	DATE RETURNED
10/12/18			
12/10/18	- 1 Wood - 1 C.S.		
	1/16/19		
1/24/19			
2/22/19	- 4 Wood - 1 C.S.		
	3/21/19 - 4 Wood - 1 C.S.		



DEFENDANTS' EXHIBIT EE
Photostat of Pattern Record Card marked A-662.
(Filed January 27, 1926.)

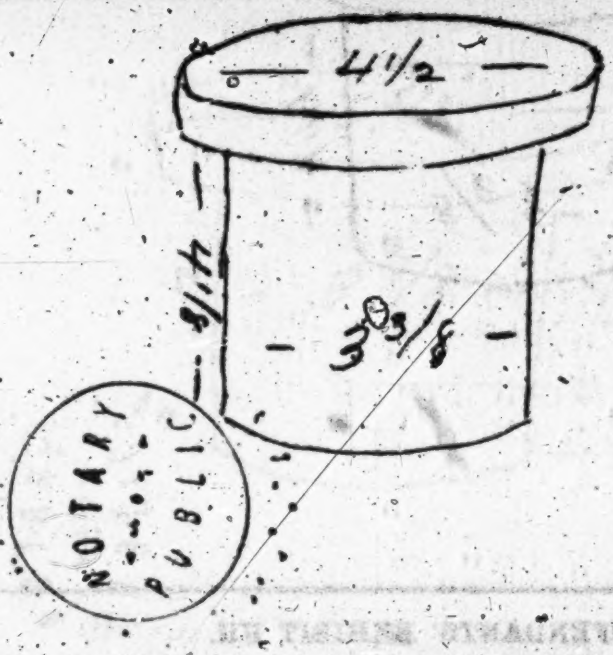
DEFENDANTS' EXHIBIT II.
Photostat of Pattern Record Card marked B-122.
(Filed January 27, 1934.)

FORM P.R.
NAME E C Levy Mfg Co ADDRESS Gulick Ex 31

PATT. NO. B122 DESCRIPTION No. OF CORE BOXES DIM. NO.

SPECIAL IDENTIFICATION 1 Wood - 1 398

DATE RECEIVED	DATE RETURNED	DATE RECEIVED	DATE RETURNED
12/19/18	12/31/18	Gilbert	
2/22/19 -	1 Wood -	1 C.B.	
	3/21/19 -	1 Wood - 1 C.B.	



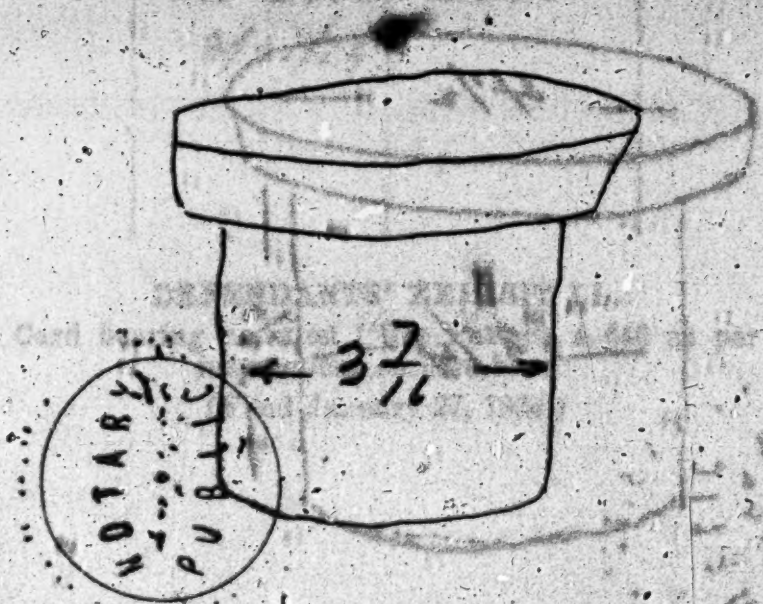
31 - B

1/16/27 Cooley N.P.

NOTARY PUBLIC

PATTERN MAKER'S NAME: E. C. Long	ADDRESS: Gulfport, Miss.
PATTERN NO.: H-4	DESCRIPTION
SPECIAL IDENTIFICATION: Blood	No. OF CORE BOXES: 1
BIN No.: 398	

DATE RECEIVED	DATE RETURNED	DATE RECEIVED	DATE RETURNED
10/10/19	1/28/20		



DEFENDANTS' EXHIBIT JJ.
Photostat of Pattern Record Card marked H-4.
(Filed January 27, 1934.)

FIRM OR NAME: E.C. Long & Co. ADDRESS: Quincy Ex 31

PATTERN NO. C723 | DESCRIPTION | No. OF CORE BOXES | BIN NO.

SPECIAL IDENTIFICATION: Wood | 1 | 398

DATE RECEIVED	DATE RETURNED	DATE RECEIVED	DATE RETURNED
1/25/19	2/6/19		
2/23/19 - 4 Wood		1 C B	
	3/21/19 -	4 Wood - 1 C.B.	

4495 B
570
571

DOCKET DEPARTMENT
MAR 17 1928

31-E

DEFENDANTS' EXHIBIT KK.
Photostat of Pattern Record Card marked C-123.
(Filed January 27, 1934.)

FORM P-4
NAME E.C. Long | ADDRESS LL

PATT. No.	DESCRIPTION	No. OF CORE BOXES	BIN No.
5640	Short Core Box		398

SPECIAL IDENTIFICATION

DATE RECEIVED	DATE RETURNED	DATE RECEIVED	DATE RETURNED
	Use Patt A 640 as per instructions on Core Box 3/21/19		

DEFENDANTS' EXHIBIT LL

Card bearing notation "Use Patt. A-640 as per instructions on core box."

(Filed January 27, 1924.)

FORM P-4 NAME E C Lang M D ADDRESS MM

PATENT NO. A641 DESCRIPTION

SPECIAL IDENTIFICATION Head

No. OF CORE BOXES 1 | BIN No. 398

DATE RECEIVED	DATE RETURNED	DATE RECEIVED	DATE RETURNED
4/18/19			

Cindy Watson
1104 Chemical Bldg

DEFENDANTS' EXHIBIT MM.
Card bearing designation, "Patt. No. A-641."
(Filed January 27, 1934.)

PISTON DESIGN.

By Harry R. Ricardo, B.A., A.M.I.C.E.

IN the March issue of *The Automobile Engineer* last year the writer gave a description of a design of aluminium piston which he had employed with considerable success. In this design a serious attempt was made:

(*a.*) To reduce the weight by disposing the material in such a way that the load was transmitted as directly as possible from the crown to the gudgeon pin and from the gudgeon to the bearing surfaces.

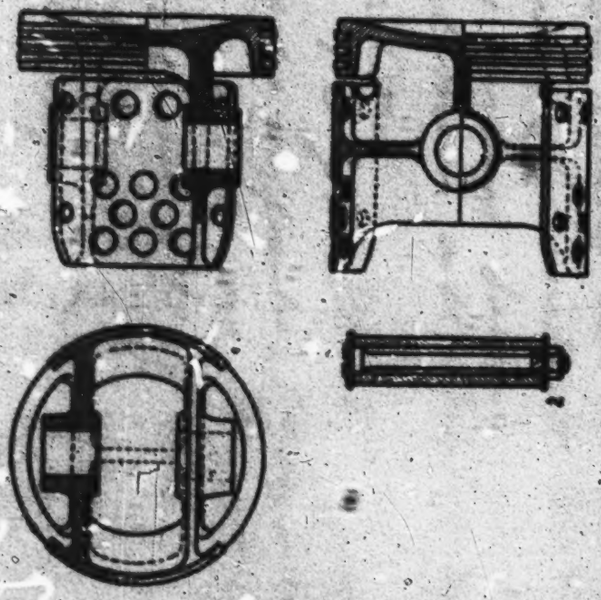
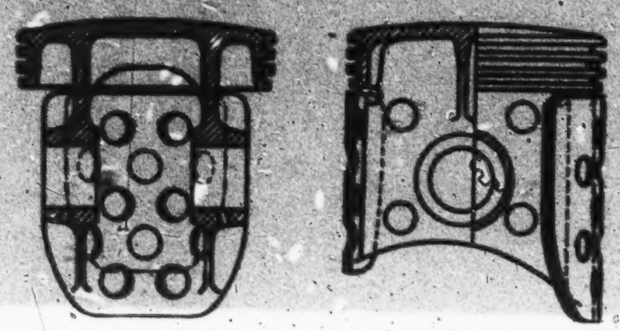


Fig. 1.
Divided slipper piston design for bores up to 5in.

(*b.*) To reduce the area of rubbing surface, thereby reducing the fluid friction of the lubricant.

(*c.*) To reduce the oil consumption and the tendency to carbonise the oil by giving free vent for the lubricant, and thus preventing it from being "rolled up" between the piston and cylinder walls, which was found to be the chief cause of oil reaching the combustion chamber.



(*d.*) To reduce the bending of the gudgeon pin by transmitting the load to it at points as near the centre as the width of the connecting rod small end bearing would permit.

Since that date a very considerable number of these pistons have been made and tested in engines of various kinds, and as a result it has been found that:

(1.) Such pistons complete with gudgeon pins and piston rings are actually about 30% lighter than aluminium pistons of the normal design and of the same thickness of crown.

(2.) The piston friction is actually about 35% less than in the case of a normal trunk piston of the same size and material.

(3.) The oil consumption is lower than in the case of an ordinary trunk piston, and the tendency to carbonise is less.

(4.) The use of a short floating gudgeon pin renders possible a very substantial reduction in the weight of the pin, for not only is the rigidity of the pin greatly increased, with the result that both the diameter and length of bearing surface can be substantially reduced without any measurable wear being detected, but also the rotation of the pin prevents any tendency to unequal or local wear. This is a very important point, for not only do these short floating pins show much less wear than the ordinary type, but also in these very light pistons the weight of the gudgeon pin itself and the small end bearing of the connecting rod constitute a serious proportion of the total reciprocating weight.

This piston, however, in common with all other aluminium pistons, requires a considerable allowance for expansion, with the result that it is liable to be somewhat noisy when cold. In order to reduce the amount of clearance necessary, the writer has recently patented a design in which the connection between the ring-carrying portion of the piston and the slipper surface is severed, so that heat can only be conducted to the slipper surfaces by way of the main webs and not down the sides. The main webs themselves are so designed that the heat conducted from the crown is distributed evenly over the surface of the slippers. The effect of this design is that the bulk of the heat is delivered to the cylinder walls through the piston rings, while only a comparatively small portion reaches the slipper surfaces, and this is distributed evenly over them. Such a design would not be suitable for very large

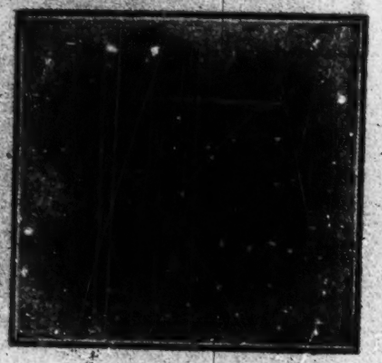
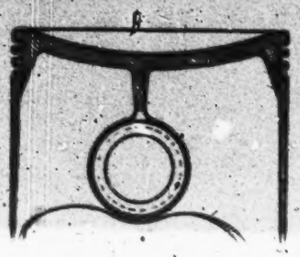
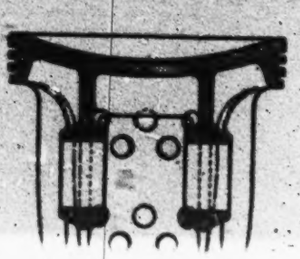


Fig. 2.

engines on account of the reduced facilities for dissipating the heat from the crown, but for pistons up to 5in. bore at any rate it appears to be quite satisfactory. Experience has shown that with these divided-slippers the clearance necessary can be reduced to about one-half of that required for the ordinary type, and to little, if any, more than is required for a cast iron piston. Such a piston of 4in. bore is shown in fig. 1. Several of these pistons have been in use in motor car engines, and their quiet running has been most noticeable.

Fig. 2 shows a further development, in which the bearing surface on the side which does not receive the maximum thrust from the connecting rod has been yet further reduced, and also the main webs





of the lubricant.

(c.) To reduce the oil consumption and the tendency to carbonise the oil by giving free vent for the lubricant, and thus preventing it from being "rolled up" between the piston and cylinder walls, which was found to be the chief cause of oil reaching the combustion chamber.

these very light pistons the weight of the gudgeon pin itself and the small end bearing of the connecting rod constitute a serious proportion of the total reciprocating weight.

This piston, however, in common with all other aluminium pistons, requires a considerable allowance for expansion, with the result that it is liable to be somewhat noisy when cold. In order to reduce the

for the ordinary type, and to little, if any, more than is required for a cast iron piston. Such a piston of 4in. bore is shown in fig. 1. Several of these pistons have been in use in motor car engines, and their quiet running has been most noticeable.

Fig. 2 shows a further development, in which the bearing surface on the side which does not receive the maximum thrust from the connecting rod has been yet further reduced, and also the main webs

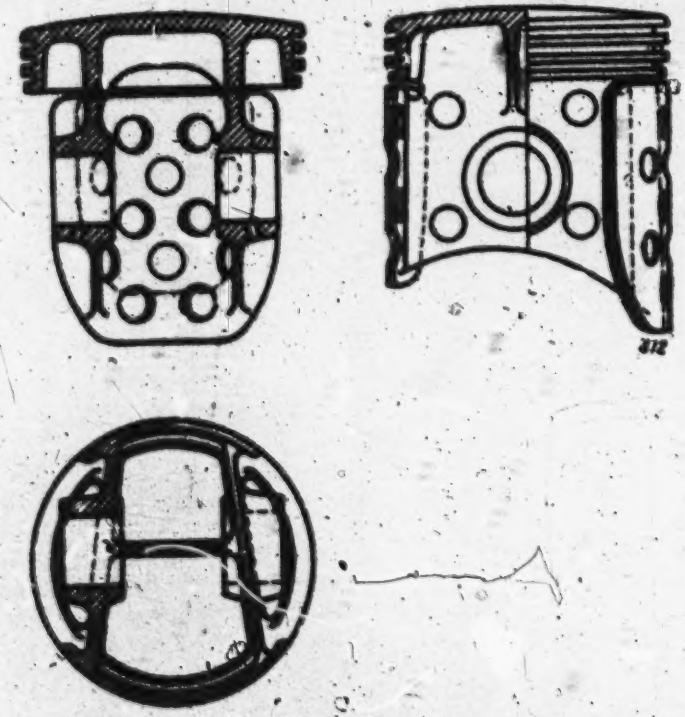


Fig. 2.
Divided dipper piston design with reduced dipper on the side opposite maximum thrust.

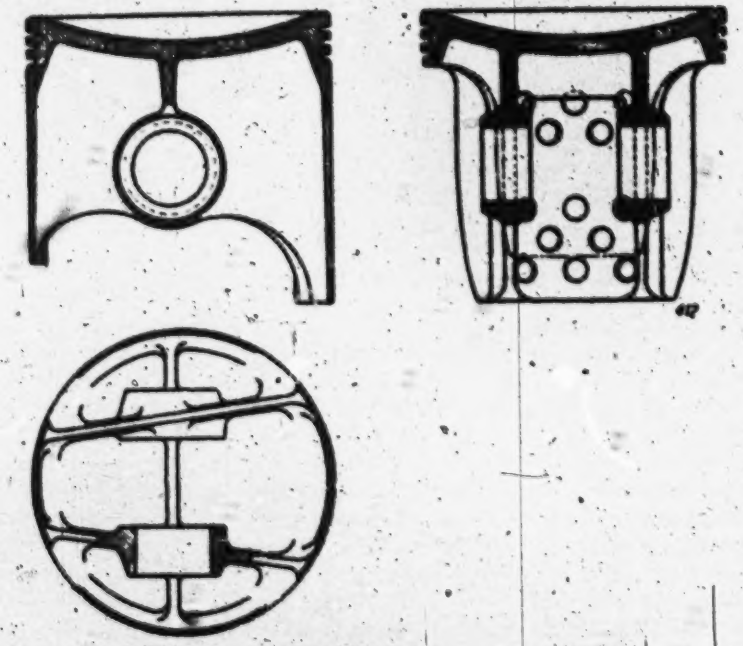
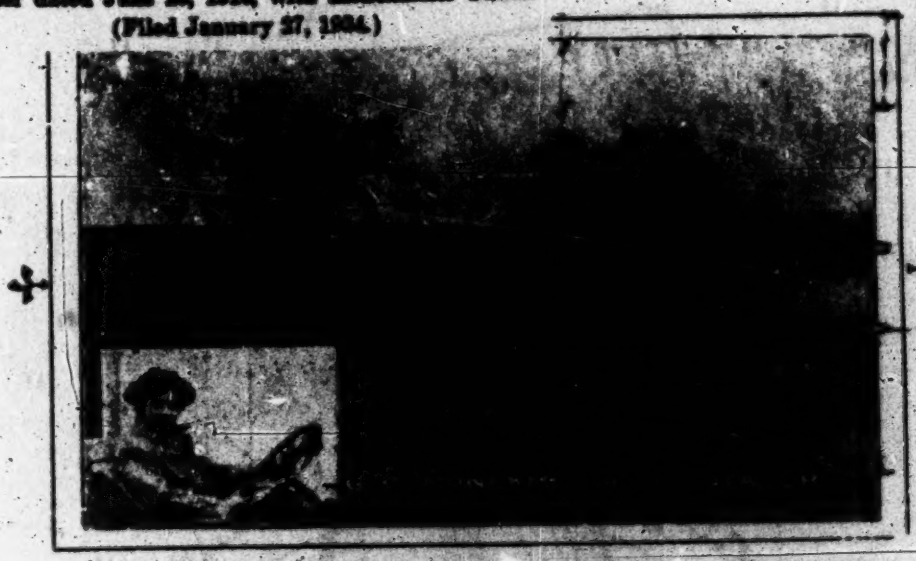


Fig. 4.
Solid dipper piston for engine of 7in. bore.

DEFENDANTS' EXHIBIT 3-S.
Page 274 of "The Automobile Engineer" of October 1918, Vol. VIII, No. 119.
(Filed January 27, 1934.)

DEFENDANTS' EXHIBIT 3-X.
Letter dated June 20, 1916, with Monckmeier Photo.
(Filed January 27, 1924.)

Defendants
Ex 3 X
30



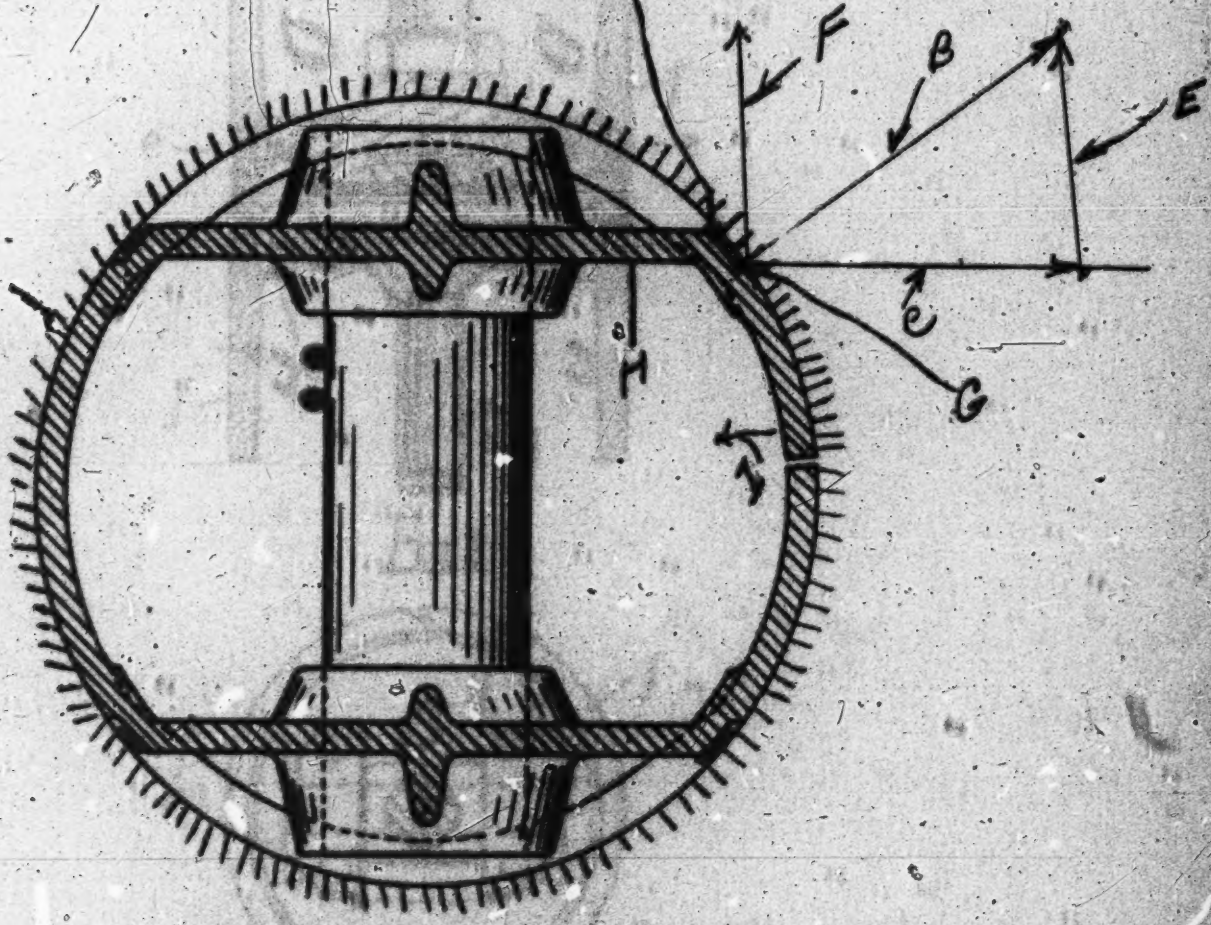
G. C. MONCKMEIER

TIPTON, IOWA, June 20 1916

Agreement
between G.C. Monckmeier seller
and August Gallmeier Buyer
the Seller of Stars Racing Car No 4.
6 Cylinder agrees to overhaul motor and
Rear axle and general looking over
and give Mr Gallmeier all Possible assistance
Necessary. to drive Car.
Parts with Car are 1 6 Cyl Block, Crankshaft
Con Rods, one 8 x 1 Differential Brake Drum
Mr Gallmeier hereby agrees to pay $850.00
for Stars 4. in payments of $200 Cash
the Rest of 650.00 in Bankable Note.
Seller Signed G.C. Monckmeier
August Gallmeier

FILED
JAN 27 1934
At ___ O'clock ___ M.
F. J. DENZLER, Clerk
U. S. District Court, N. D. O.

Defts Ex 4-A
30



DEFENDANTS' EXHIBIT 4-A
Stellmax Sketch of Maynard Patent Structure.
(Filed January 27, 1934.)

FILED
JAN 27 1934
At ____ O'clock ____ M.
F. J. DENZLER, Clerk
U. S. District Court, N. D. O.

Defts Ex 4-A
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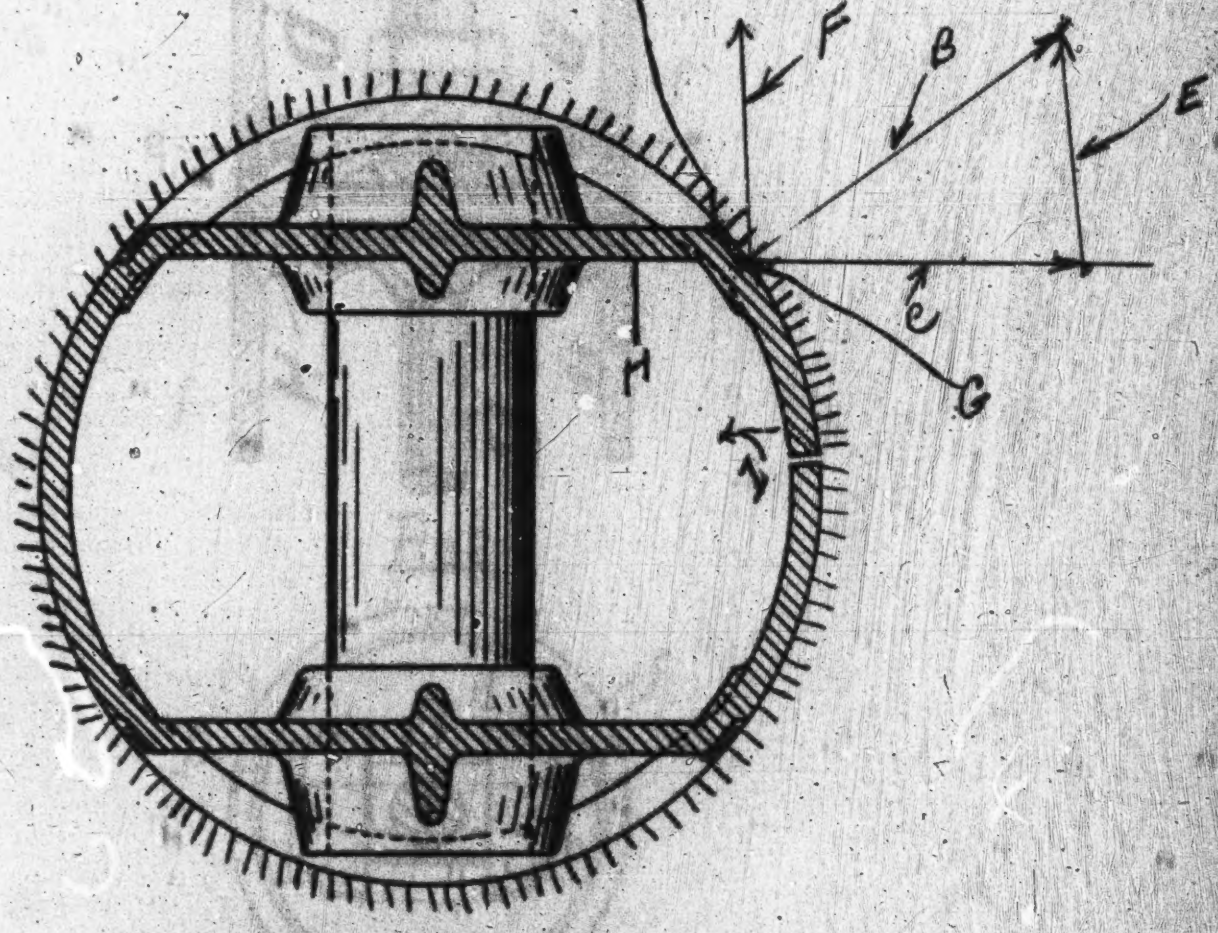


DEFENDANTS' EXHIBIT 4-A.
Stellman Sketch of Maynard Patent Structure.
(Filed January 27, 1934.)

Def. 4-B

Fig.1

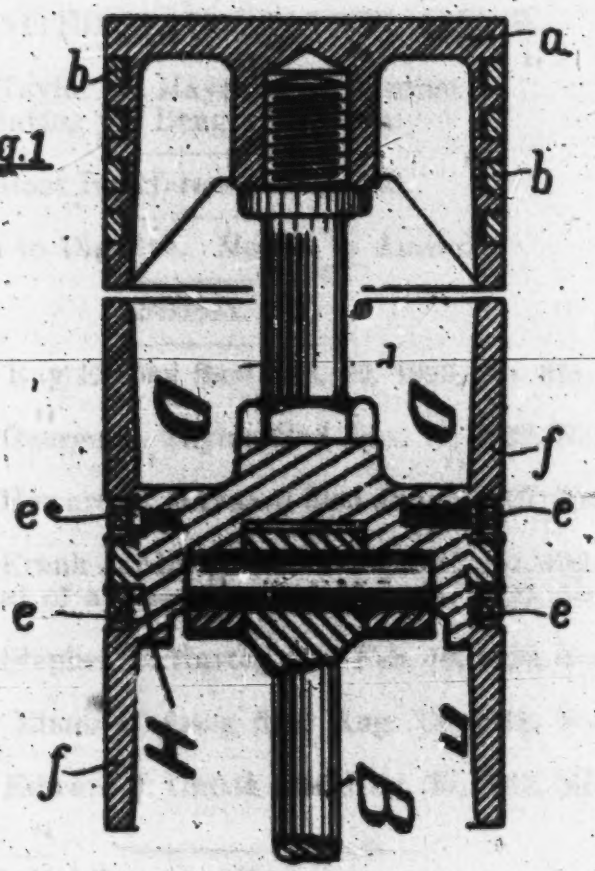
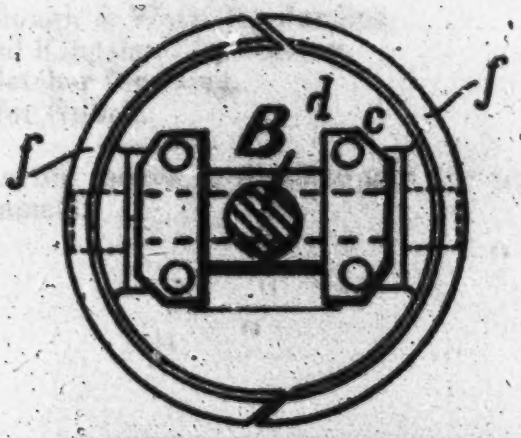


Fig.2



DEFENDANTS' EXHIBIT 4-B.
Photostat of Roots Superimposed on Ebbs.
(Filed January 27, 1934.)

DEFENDANTS' EXHIBIT 4-C.

Decision of Law Examiner, dated April 4, 1924 in Interference No. 49,569.

(Filed January 27, 1934.)

Hearing: March 10, 1924. kse

IN THE UNITED STATES PATENT OFFICE.

Day vs. Taylor vs. Maynard vs. Jardine vs. Hartog vs. Long vs. Gulick.

Patent Interference No. 49569.

Motion to Dissolve. Motion to Amend.

Pistons.

Application of Ray E. Day filed Jan. 10, 1923, No. 611,-698.
Application of George A. Taylor filed June 17, 1922, No. 569,104.
Application of Howard E. Maynard filed Jan. 3, 1921, No. 434,467.
Application of Frank Jardine filed Mar. 9, 1921, No. 450,-898, renewal of application filed Mar. 11, 1920, No. 364,997.
Application of Stephen D. Hartog filed Feb. 16, 1920, No. 359,137.
Application of Elmer C. Long filed Aug. 13. 1919, No. 317,273.
Application of Edward J. Gulick filed Nov. 30, 1917, No. 204,661.

Mr. Clarence E. Mehlhope for Day.,
Messrs. Macleod, Calver, Copeland & Dike for Taylor.
Mr. J. King Harness for Maynard.
Messrs. Richey, Slough & Watts for Jardine.
Messrs. Rippey and Kingsland for Hartog.
Mr. Herbert G. Fletcher for Long.
Mr. Ray S. Gehr for Gulick.

The party Hartog moves to dissolve and the party Gulick moves to amend.

The issue is defined in a single count which is as follows:

> A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

Hartog's motion denies the right of Gulick and Hartog to make the count. As to Gulick it alleges that in his disclosure there are no walls separate from the head portion "integrally uniting said bosses." The quoted excerpt from the count has an apparent meaning which is different from the necessary meaning dependent upon the context. The complete phrase is "walls integrally uniting said bosses, the guide portion and the head portion" which means nothing less than that the bosses, guide portion and head portion are integrally united by walls. In Gulick's drawings the bosses 16, the guide portion 11, and the head portion 10 are integrally united by walls 17, 18, 20. This structural arrangement satisfies the requirement of the count.

As to Hartog a similar allegation is made to the effect that Hartog's disclosure does not have "walls integrally uniting said bosses," but it is plain in Figs. 1 and 4 of Hartog that walls 12 integrally unite bosses 13, guide portion 11 and head portion 10. It follows that Hartog's motion must be denied.

The amended motion to amend by Gulick presents claims 34 to 47 which are as follows:

> 34. A one piece piston having a solid end portion and skirt portion which is adapted to engage the entire circumferential wall of the cylinder in which it reciprocates, said piston being provided with an annual slot cut entirely through the thickness of its peripheral wall, a pair of wrist pin bearings, connecting means extending from said solid end portion to said bearings, said skirt portion having a slot cut entirely through the thickness of its peripheral wall extending from one end of the pis-

ton to said annular slot, and connecting means extending from each of said bearings to said skirt portion.

35. A one piece piston having a solid end portion and a skirt portion which is adapted to engage the entire circumferential wall of the cylinder in which it reciprocates, said skirt portion being provided with an annular slot, a second slot extending from one end of said skirt portion to said annular slot, said slots being cut entirely through the thickness of the peripheral wall of the skirt portion, a pair of wrist pin bearings, and integral means depending from the solid end portion of the piston to said bearings and said skirt portion for the support of said skirt portion.

36. A piston comprising a head, a skirt separated therefrom by a continuous transverse slit, a longitudinal slit extending from the latter to the lower edge of the said skirt, and means for connecting the portions of the skirt which bound said longitudinal slit with said head.

37. A piston having a head and body parted from each but held integrally connected with each other by internal yielding ribs, a slit cut through the body providing means for expansion and contraction of said body.

38. A piston having a head and a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

39. A piston as claimed in claim 38 characterized by being integrally cast.

40. A piston as claimed in claim 32 characterized by being integrally cast.

41. A piston comprising a head, a cylindrical skirt beneath said head, parallel webs extending downwardly from said head and connected to said skirt whereby recesses are provided between the lower ends of said webs and said skirt and between the upper ends of said skirt and said head, one side of said skirt between the points of attachment of said webs thereto being slitted longitudinally, and wrist pin bearings carried by said webs.

42. In a piston for an internal combustion engine, the combination of a head provided with ring grooves therein, a pair of webs integral with and dependent from said head and located opposite each other, diametrically oppositely disposed wrist pin bosses, one in each of said webs, a skirt for said piston, integrally connected to each of the side edges of the webs, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston.

43. In a piston for an internal combustion engine, the combination of a head and a pair of cordal webs substantially rectangular in shape, located opposite each other in the piston and connected integrally at their upper edges to the piston head, diametrically oppositely disposed wrist pin bosses, one in each of said webs, and a skirt for said piston integrally connected to each of the side edges of the webs, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston.

44. In a piston for an internal combustion engine, the combination of a head, webs integrally connected to said head and dependent therefrom, oppositely disposed piston pin bosses mounted one in each of said webs and integral therewith, a skirt for said piston, integrally connected to each of said webs and extending beyond the same, said piston being provided with circumferential slots between the head and skirt and with a longitudinal slot connecting one of said circumferential slots and the open end of the skirt of the piston.

45. In a piston for an internal combustion engine, the combination of a head having ring grooves therein, a plurality of cordal webs integrally connected with the piston head and extending downwardly therefrom, oppositely disposed piston pin bosses, integral with said webs and mounted therein, a skirt for said piston longer than said webs and interconnected at the side edges of the webs to each of said webs, said piston being provided with circumferential slots between the head and skirt and with a longitudinal slot connecting one of said circumferential slots with the open end of the skirt.

46. In a piston of the class described, a cup-like head comprising a pressure receiving end and a wall portion, a skirt circumferentially disconnected from the wall portion of the head and divided from end to end, and skirt carriers connecting said skirt to the pressure receiving end, said skirt carriers being disconnected from the wall portion of the head and susceptible of being slightly flexed radially.

47. A piston comprising a head, a skirt having resilient sections separated from said head by a slit extending continuously around the piston, and means for yieldingly connecting said skirt sections with said head.

Claims 34 and 35 are copies of Long's claims 4 and 7 in his application No. 317,273. They appear to be unpatentable over the patent to Spillman No. 1,092,870 or the French patent to Chenard No. 468,595 of 1914, in view of the patent to Ebbs No. 700,309. The French patent and the Spillman patent show all that is claimed except the longitudinal slot which is found in Ebbs and can accommodate circumferential thermal expansion.

Claim 36 is the same as claim 13 of Long which defines no patentable novelty over the patent to Ebbs No. 700,309. The portions of the skirt which bound the longitudinal slit are not necessarily closely adjacent to the slit, and in Long's disclosure the connecting means 11 is not closely adjacent to slit 7.

Claim 37 is claim 4 of Hartog's application No. 359,137 and is not patentable over the issue in Interference No. 49570, the slit through the body portion being without novelty in view of Ebbs patent No. 700,309. Gulick can make this claim.

Claim 38 is the same as claim 20 of Hartog. Gulick can make it but it is not patentably distinct from the issue in Interference No. 49572.

Claim 39 would not be patentably different from claim 38 since it is common to make pistons of cast metal.

Claim 40 is similar to Hartog's claim 25, and like claim 39, would not be patentably different from claim 38.

Claim 41 is the same as claim 7 of Maynard Ser. No. 434,467. This claim does not distinctly define the invention it purports to cover and is objectionable because the structure recited prior to the "whereby" clause in line 3 is not sufficient to support the function stated in the

"whereby" clause. Merely extending parallel webs downward from the head to the skirt will not form any definitely located "recesses." Claim 42 is the same as claim 7 of Jardine No. 450,898. It can not be made by Gulick since he has not a plurality of ring grooves nor a plurality of circumferential slots. Claim 43 is the same as claim 8 of Jardine. It is not patentably distinct from claim 42. Gulick can not make it because he does not disclose a pair of cordal webs *substantially rectangular* in shape, and the circumferential *slots* between the skirt and the head.

Claim 44 is a copy of Jardine's claim 9. Since Gulick has not a plurality of circumferential slots he can not make it. Claim 45 is claim 10 of Jardine. Gulick can not make it for the same reasons that he can not make claim 42. Claim 46 is claim 19 of Jardine which is the issue of Interference No. 49578. It is very doubtful if Gulick's skirt carriers 17, 18, 20 are susceptible of being slightly flexed radially and it is held he can not make this claim. Claim 47 is claim 22 of Jardine which is the issue of Interference No. 49583, Hartog v. Jardine v. Spillman. It is not clear that Gulick can make this claim because his skirt is not divided into a plurality of resilient sections by a plurality of longitudinal slits. He has a single longitudinal slit and the skirt comprises a single integral device whose ends terminate at the edges of the longitudinal slit. In the pistons of Hartog, Jardine and Spillman the skirt is divided into sections by a plurality of longitudinal slits.

The amended motion to amend is denied for the reasons stated.

Hartog's motion is denied.

A limit of appeal from the decision on Gulick's amended motion is set to expire April 24, 1924.

I. P. DISNEY,
Law Examiner.

April 4, 1924.

DEFENDANTS' EXHIBIT 4-D.

Decision of Law Examiner, dated April 4, 1924, in Interference No. 49,574.

(Filed January 27, 1934.)

Hearing: March 4, 1924. AS

IN THE UNITED STATES PATENT OFFICE.

DAY v. TAYLOR v. LONG v. MAYNARD v. HARTOG v. GULICK.

PATENT INTERFERENCE No. 49,574.

MOTION TO DISSOLVE.

PISTONS.

Application of Ray E. Day filed January 10, 1923, Ser. No. 611,698.
Application of Geo. A. Taylor filed June 17, 1922, Ser. No. 569,104.
Application of Elmer C. Long filed January 17, 1921, Ser. No. 437,690.
Application of Howard E. Maynard filed January 3, 1921, Ser. No. 434,467.
Application of Stephen D. Hartog filed February 16, 1921, Ser. No. 359,137.
Application of Edward J. Gulick filed November 30, 1917, Ser. No. 204,661.

Mr. Clarence E. Mehlhope for Day.
Messrs. Macleod, Calver, Copeland and Dike for Taylor.
Mr. Herbert G. Fletcher for Long.
Messrs. Whittemore, Hulbert & Whittemore and Mr. J. King Harness for Maynard.
Messrs. Rippey and Kingsland for Hartog.
Mr. Ray S. Gehr for Gulick.

The parties Hartog and Long move to dissolve on the ground of non-patentability of the issue.

The single count of the issue is as follows:

> A piston closed at one end and open at its opposite end, said piston having an annular cutting formed through the thickness of its peripheral wall thereby providing a separated sleeve-like skirt which is approximately cylinder bearing in its entirety, a

pair of wrist pin bearings depended from said piston end and being free from engagement with said skirt, supporting means extending from each of said bearings to said skirt, said skirt being provided with a longitudinal slot cut through the thickness of its wall and extending from the open end thereof to said annular cutting.

The party Hartog relies upon the following patents:

Derby & Kaiser, 1,053,790, Feb. 18, 1913,
Spillman & Mooers, 1,092,870, Apr. 4, 1914,
Ebbs, 700,309, May 20, 1902.

The party Long relies upon the same patents to Spillman and Mooers and Ebbs.

In the Derby patent it is not seen that the piston has an annular cutting formed through the thickness of its peripheral wall thereby providing a separated sleeve-like skirt, and the longitudinal slot mentioned in lines 8 and 9 of the count does not extend in the Derby patent to "said annular cutting."

The patent to Spillman would anticipate the count if there is no inventive effort in forming the longitudinal slot in the skirt. The primary examiner has so held and the longitudinal slot is found in the patents to Ebbs or Derby.

The application of the Spillman patent to the count, except for the longitudinal slot, seems to be clear and requires no discussion. The count does not distinctly include any specific elements or relation of elements from which any functions not possible in the patents cited would flow and its scope may not be restricted beyond the fair and ordinary meaning of its terms.

The patent to Ebbs discloses all the elements of the count except a pair of wrist pin bearings depended from the piston end and free from engagement with the skirt.

It seems to be immaterial from a patentable standpoint whether the cross head has one relatively long bearing or two short bearings for the connecting rod wrist pins, and the cross head bearing is free from engagement with the parts of the skirt opposite to the ends of the bearing. The patent to Ebbs alone is a substantial anticipation of the count.

The motions are granted.

A limit of appeal is set to expire April 24, 1924.

I. P. Disney,
Law Examiner.

April 4, 1924.

DEFENDANTS' EXHIBIT 4-E.

Decision of Law Examiner, dated April 4, 1924, in Interference No. 49,580.

(Filed January 27, 1934.)

Hearing: March 5, 1924. kse

IN THE UNITED STATES PATENT OFFICE.

TAYLOR vs. LONG vs. HARTOG vs. GULICK.

PATENT INTERFERENCE No. 49580.

MOTION TO DISSOLVE.

PISTONS.

Application of George A. Taylor filed June 17, 1922, Ser. No. 569,104.
Application of Elmer C. Long filed Dec. 17, 1921, Ser. No. 522,974.
Application of Stephen D. Hartog filed Feb. 16, 1920, Ser. No. 359,137.
Application of Edward J. Gulick filed Nov. 30, 1917, Ser. No. 204,661.

Messrs. Macleod, Calver, Copeland & Dike for Taylor.
Mr. Herbert G. Fletcher for Long.
Messrs. Rippey and Kingsland for Hartog.
Mr. Ray S. Gehr for Gulick.

The parties Long and Hartog move to dissolve on the ground that the issue is unpatentable in view of the patent to Spillman and Mooers, No. 1,092,870, April 4, 1914.

The single count of the issue is as follows:

> A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses, integrally connected to the head and to the upper and lower part of the skirt, the outer ends of the pin bosses being spaced from the opposing parts of the skirt wall and said skirt having openings opposite the open ends of the bosses.

The patent clearly satisfies all the requirements of the count except the limitation that the pin bosses are to be integrally connected to the upper part of the skirt.

The pin bosses in the patent are obviously integrally connected to the head and to the lower part of the skirt, the latter connection at a point remote from the head, being designed by the patentee to avoid as much as possible the transmission of heat from the hot piston head to the skirt. The count gives no indication of any definite reason for connecting the pin bosses to the upper part of the skirt but the natural and obvious reason would be to reinforce or strengthen the connection between the pin bosses and the skirt. This is accomplished in Gulick's piston by elongating the attachment of the rib to the skirt at points adjacent to the skirt but any form of integral connection from the piston boss to the upper part of the skirt as well as to the lower part would be covered by the count. The point for decision is therefore reduced to the simple proposition: Is it patentable to connect the pin boss to the upper part of the skirt for any ordinary purpose, such as to reinforce the support of the skirt? If it should be found that the support of the skirt by connection to its lower part is insufficient, it seems clear that no more than common mechanical skill would be required to correct the defect and supply the remedy by additional connections or braces between the upper part of the skirt and the pin boss. It is true the advantage sought by the patentee would be lost in part but an adequate support for the skirt would be just as necessary as the avoidance of undue heating and the loss in one respect would be offset by the gain in the other. The idea of reinforcing or strengthening weak parts has been repeatedly recognized as requiring no inventive effort. *Turner v. Lauter*, 248 Fed., 931, 933. *Walker Mfg. Co. v. Illinois Brass Mfg. Co.*, 265 Fed., 279.

The motion is granted.

A limit of appeal is set to expire April 24, 1924.

I. P. DISNEY,

Apr. 4, 1924. *Law Examiner.*

DEFENDANTS' EXHIBIT 4-F.

Decision of Law Examiner, dated April 7, 1925, in Interference No. 49,575.

(Filed January 27, 1934.)

Hearing: March 20, 1925. kse

IN THE UNITED STATES PATENT OFFICE.

LONG VS. GULICK.

PATENT INTERFERENCE No. 49,575.

APPEAL FROM THE EXAMINERS-IN-CHIEF.

PISTONS.

Application of Elmer C. Long filed December 17, 1921, Ser. No. 522,974.
Application of Edward J. Gulick filed November 30, 1917, Ser. No. 204,661.

Mr. Herbert C. Fletcher for Long.
Mr. Ray S. Gehr for Gulick.

The party Long has appealed from the decision of the examiners-in-chief, affirming that of the examiner of interferences, awarding priority to the senior party, Gulick, for invention of the subject matter as defined in the following count:

> A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

A motion to dissolve was presented by Long to the law examiner on the ground that Gulick had no right to make the claim by reason of lack of disclosure. This motion was denied by the law examiner and judgments of priority by the tribunals below followed.

No testimony having been taken and Long being the junior party, the only question here to be reviewed is that of Gulick's right to make the claim involved in the issue.

The construction relates to a piston for a motor, preferably of the internal combustion type, in which there is a head and a separate skirt portion, the latter connected with the pin bosses on both sides by flanges. The skirt portion is split from top to bottom on one side and by virtue of such an arrangement free expansion and contraction of the skirt portion is obtained. Both parties have constructions which fall within the terms of the count but the party Long contends that the construction of Gulick is not such as to "permit free expansion and contraction of the skirt portion." The flanges of Long are set at an angle with respect to the pin bosses and for this reason Long contends that the skirt portion is free to expand and contract. The Gulick flanges are extended at right angles to the axis of the pin bosses and Gulick states that this results in a rigid construction between the pin bosses and the guide portion of the piston.

In the operation of a piston of this character in a gas engine there are wide changes in temperature with resulting expansion or contraction of the metal of the parts. The cylinder wall elongates in a line at right angles to the movement of the cylinder and this elongation, in the construction of both parties, is provided for by the slot in the skirt of each piston. The party Long contends that with his construction, the flanges move about their points of attachment to the bosses as centers and in that manner pull the expanding cylinder wall inward and prevent the binding or freezing of the piston in the cylinder. Since Gulick has stated that the connections between the bosses and the cylinder skirt are "extremely rigid," Long contends that such action as takes place in his construction is impossible with that of Gulick. Long further contends that this rigid connection would result, with Gulick's piston, in use, in the piston wall loosing its round shape and binding in or scoring the cylinder. An explanation is submitted by Long as to the result of an expansion of the cylinder wall of Gulick and the conclusion was pressed at the hearing that the skirt would tend to increase the piston diameter rather than decrease it at such time.

It is not believed that the result, stated by Long to follow the use of his piston, differs from that obtained in

the use of Gulick's piston. The material of which both types of pistons are made will readily yield to the small extent required to bring the piston skirt to the proper diameter and such yielding is so small as to be within the stress or elasticity limits of the material. It is believed substantially the same action takes place with the constructions of both parties and that in each instance the skirt will move the small distance permitted by the slot to accommodate itself to the pressure and stress conditions brought about by the temperature changes. It is doubted if, in either construction, the flanges move as indicated in Long's Figure 5, as if they were pivoted to the pin bosses. There would be some yielding throughout the length of the flanges unless these were made especially thin where they join the bosses. Likewise, in Gulick's construction, and it must be remembered the motion is extremely slight and measured in thousands of an inch, there would be stresses and yielding throughout the lengths of the flanges. It would seem clear enough the operation is substantially the same in the Gulick as in the Long construction. The expression "free expansion and contraction" must be interpreted in view of the disclosure of Long as well as that of Gulick. The count did not originate with Long. The term "free" must mean a movement which must overcome the resistance of the flanges to flexure in the construction of Long and when this is done, a similar interpretation makes the terms applicable to the construction of Gulick. It is believed plain the latter is entitled to make the count of the issue.

The party Long has urged that the count of the issue is unpatentable over the prior art upon which the count in interference No. 49,574, involving the same parties, was held unpatentable by the law examiner. No motion to dissolve as to the instant count was made and, except in a very clear case, the matter should not be considered at this time. It is noted, however, that while the count of the instant interference appears quite similar to that which constituted the issue of interference No. 49,574, yet the present count has two limitations not found in that of the dissolved interference. The first of these is that the flanges connect the pin bosses with the skirt on both sides of the bosses. The second restriction is that the single split is on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

The Spillman and Mooers patent, which was regarded as capable of modification in accordance with the Ebbs patent in order to anticipate the count of interference No. 49,574, does not disclose flanges connecting with the skirt on both sides, but the connecting member is in the form of an oppositely apertured cylindrical portion having a flared, more or less disk shaped bottom, which is connected to the skirt below the bosses. The functional limitation at the end of the count implies a yielding in the connecting flanges, as otherwise a skirt with a single slit would not be freely expansible and contractible. The disk shaped connector of Spillman and Mooers would have a stiffening or trussing effect on the skirt so that even if slotted as suggested in the count, the skirt would be substantially unyielding. It is believed the present count is patentable and that in so holding there is no inconsistency with the law examiner's decision in interference No. 49,574.

The decision of the examiners-in-chief awarding priority to the senior party Gulick is affirmed.

WM. A. KINNAN,
First Assistant Commissioner.

Apr. 7, 1925.

DEFENDANTS' EXHIBIT 4-G.
s 362, 363 and 394 of "Automotive Industries"
for January 29, 1920.
(Filed January 27, 1934.)

AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE

4G

January 29, 1920

Aluminum Piston Design

This discussion divides the problem in two classes and then takes up the details of each class. The four points on which objections to these problems are based—wear, slaps, excessive oil consumption and crankcase dilution—are treated separately.

By E. G. Gunn

FROM a thermal standpoint aluminum pistons may be broadly divided into two classes:

(1) Those designed with the object of conducting the heat away from the head into the skirt and thence into the cylinder walls.

(2) Those designed with the object of partly insulating the skirt from the heat of the piston head.

Those in the first class are usually more or less conventional in design except that they have thicker walls, or ribs extending down from the head. They are generally used for high-duty engines. In these engines, which are usually of a rather large bore and comparatively low speed, the weight of the piston is secondary to its ability to keep the head from overheating, and piston slaps are not of much consequence. Therefore, for heavy-duty engines pistons of the first type seem logical. Sections of some of the types which come under the first group are given in Figs. 1, 2 and 3.

Passenger-Car Engines

For passenger-car engines the conditions are somewhat different. The duty is lighter and the bore usually smaller. This lessens the tendency toward excessive heat. Quietness being important, close-fitting pistons are desirable. Need for good accelerating ability and smoothness in operation makes lightness desirable. These considerations have led to much development work on pistons of the second type. The plan followed in most cases is to partially insulate the skirt from the piston head, thus minimizing the expansion of the skirt due to heat. Some of the ways of accomplishing this are shown in Figs. 4 to 11, inclusive.

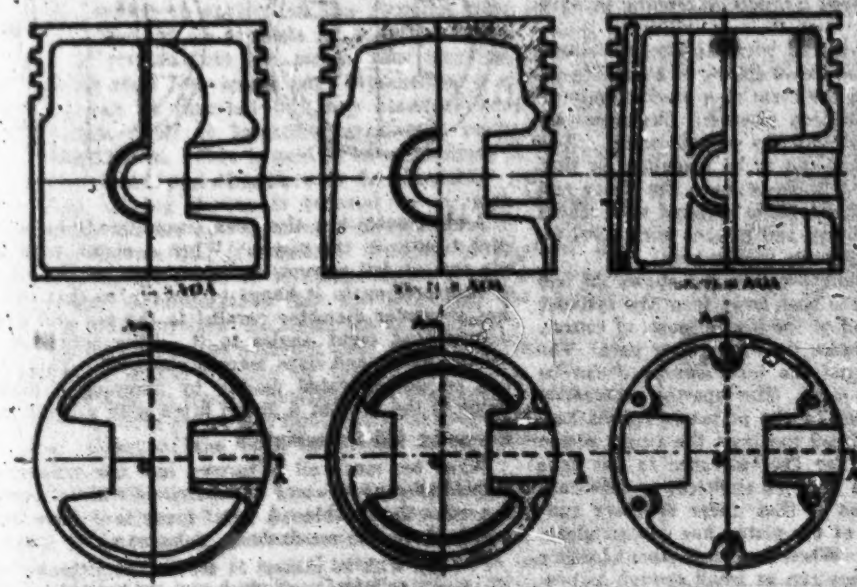
Pistons of the Long and Franquist type are split to allow the piston to spring. They run for this reason be fitted more closely than the more conventional types. The conventional type with the comparatively thin wall is probably the most popular, and for the smaller bores serves very well. It is simpler and somewhat cheaper to make than other types. In all the other types shown there has been an attempt to insulate the skirt from the head. This allows the piston to be fitted more closely, thus minimizing piston slaps.

Four points are often brought up as objections to the use of aluminum pistons. These objections are the same as those encountered in the use of cast-iron pistons.

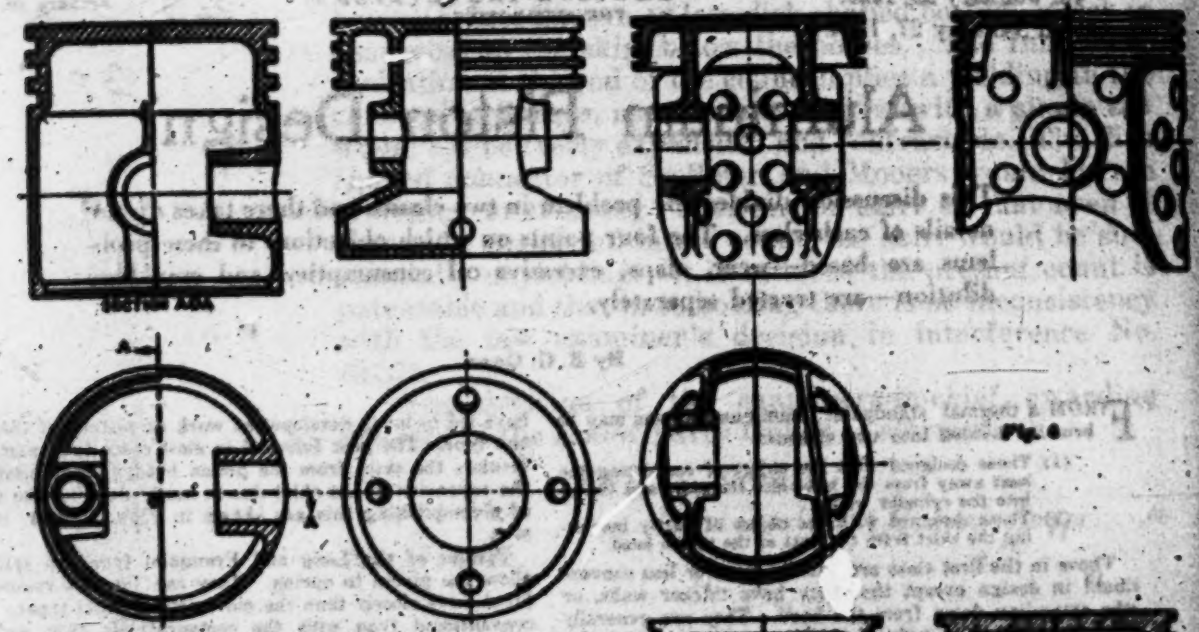
(1) Wear.
(2) Piston slaps.
(3) Excessive oil consumption.
(4) Crankcase dilution.

Wear has been shown to be largely a function of original smoothness. It is unreasonable to expect long life when aluminum pistons are fitted to cylinders of relatively hard material having a rough bore. Aluminum has been shown to be a good bearing metal, but it must run on a smooth surface, as in the case of babbitt metal. Much attention is paid to polishing the journals of a crankshaft, but we offer our cylinder bores, whether ground or reamed, which are so rough that they can be marked with a lead pencil, although they may appear to be smooth. This is undoubtedly the cause of a great deal of initial wear on aluminum pistons. When cast-iron pistons are fitted this is not so apparent. Dust in the air also plays a very important part in wear. Engines run on the dynamometer give much longer service than engines in cars.

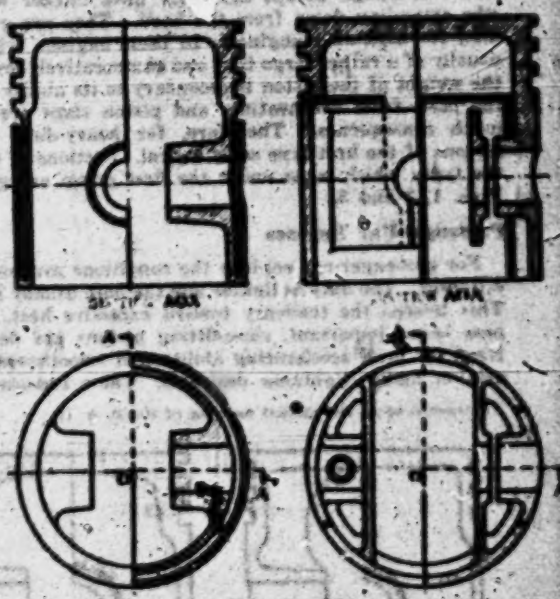
I have lately examined a truck piston with the top ring worn nearly in two, and with over 1/32-in. side clearance. The rings and piston were



Figs. 1, 2 and 3



Figs. 4 and 5



Figs. 7 and 8

both polished and showed no sign of scoring. This same model has repeatedly stood the same number of hours' running on test with wear so slight as to be hardly measurable. There is no question that an efficient air-cleaning device would greatly prolong piston and cylinder life.

Piston Slaps

Piston slaps can be overcome by using proper clearance. Pistons of the second design tend to make this condition easier to meet. Offsetting the piston-pin also tends to reduce piston slap. With 3½-in. and smaller bores there should be no trouble due to sticking with pistons of the conventional design fitted closely enough to prevent slap, provided the piston and cylinder are of proper design. There should be no local hot-spots, and care should be taken in the design to prevent a condition tending to warp the cylinder when heated.

Much trouble was experienced with sticking aluminum pistons in a certain inverted-sleeve engine of about 3½-in. bore. The cylinder was in the form of a block aluminum casting, with inserted cast-iron sleeves. Clearances up to 1/64 in. were tried, but still the pistons seized. The sleeves were removed and found to be machined so that there was an air-gap of 0.005 in. between the sleeve and the cylinder wall. These sleeves were replaced with others which fitted all the way down, and pistons with 0.007-in. clearance were then found to be satisfactory.

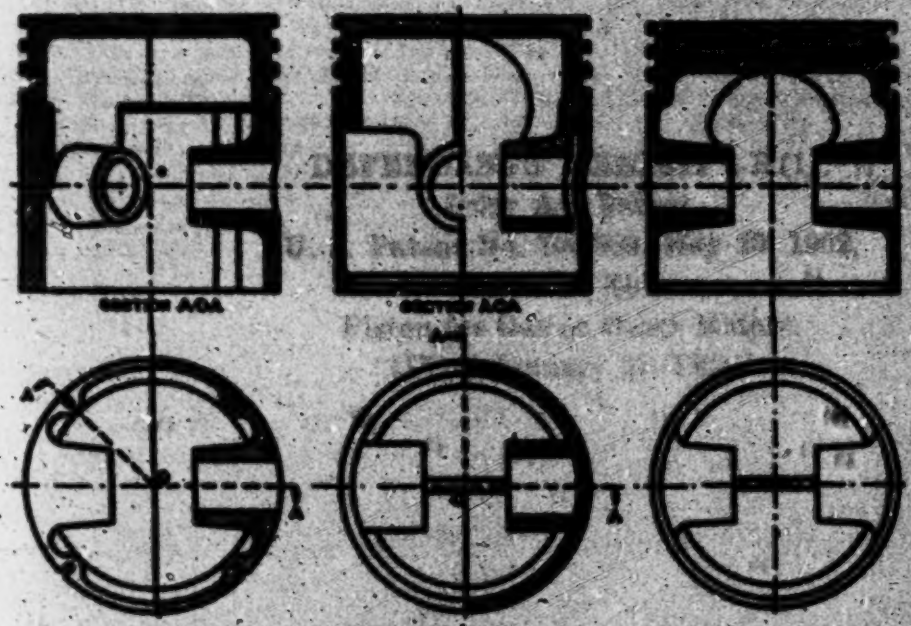
This is perhaps an exaggerated case, but shows the bad effect of failure to carry the heat away from the cylinder bore rapidly. The top land of the piston must, of course, be given much more clearance than any other part. The next land requires less, and the least clearance can be given to the bottom of the skirt. The tapering necessarily increases rapidly as the top of the piston is approached. When the piston-pin is placed too near the rings, piston slaps are more frequent, for the clearance in the zone near the piston-pin bosses must be sufficient to take care of extreme load conditions so that under ordinary running conditions this part of the piston has enough clearance to allow piston slaps. When the pin is placed further from the head the clearance can be small enough to prevent slaps.

Ring trouble has also been encountered, due to fitting pins tightly in the pistons. When a piston with a tight pin is heated it expands and creeps out on the pin; when it contracts again it hangs to the pin so that the piston has a greater diameter parallel to the pin and a smaller diameter at right angles to it. This condition makes sticking easier and slaps more pronounced. This creeping can be demonstrated readily by applying a blow-torch flame to the head of a piston fitted with a tight pin.

Excessive Oil Consumption

When too much oil is thrown into the cylinder bores, tight-fitting pistons and special rings will not completely overcome the trouble. A great many tests have been run which show this conclusively, demonstrating that:

(1) With no control on the oil being thrown into the cylinder, rings which seal the top and bottom edges of the groove reduced the oil consumption.



Figs. 8, 10 and 11

The engine was used run with a device arranged to limit the clearance to a compression of about 100 lbs. per sq. in. This was accomplished in such a way that the combustion volume of head was applied when idling. The effect upon fuel consumption was observed through a glass window and was clearly evident. The result was to diminish the amount of fuel in the oil-gas when idling, and the vibration was not seriously affected thereby.

Before the installation of the locking device a block developed was found on spark plugs taken from the cylinders of cars on road test even when the oil consumption was very low.

After the installation of the spark-plug mounted above under all conditions. It has been necessary practice for a number of years to put a quantity of kerosene in the crankcase oil when running in an engine to allow the bearing parts to run more quickly.

It is fair to expect that crankcase dilution has the same effect and that users could save fuel by the use of the locking device with unthinned fuel.

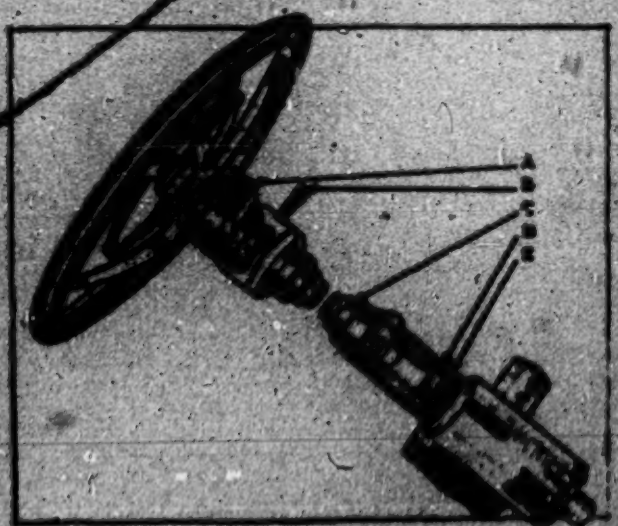
S. S. C. C. Steering Gear Lock

We show herewith an illustration of a novel lock which is applied to the steering gear of a car. The device consists of a spring detent, which is cast or riveted into the worm gear housing, and of a machine steel interruption part attached to a special shaft, which can be inserted into any desired steering wheel. The lock itself is located immediately underneath the steering wheel. This is said to have the advantage of additional convenience, and therefore to be particularly ...

This locking device is owned by Messrs. [illegible] Mr. H. Miller, and is being manufactured by the Miller Tools Service Co., Milwaukee. Samples of the lock are now being sold on Miller, White, Sterling and Grant cars, and we understand that the device has the approval of the Underwriters' Laboratories of Chicago.

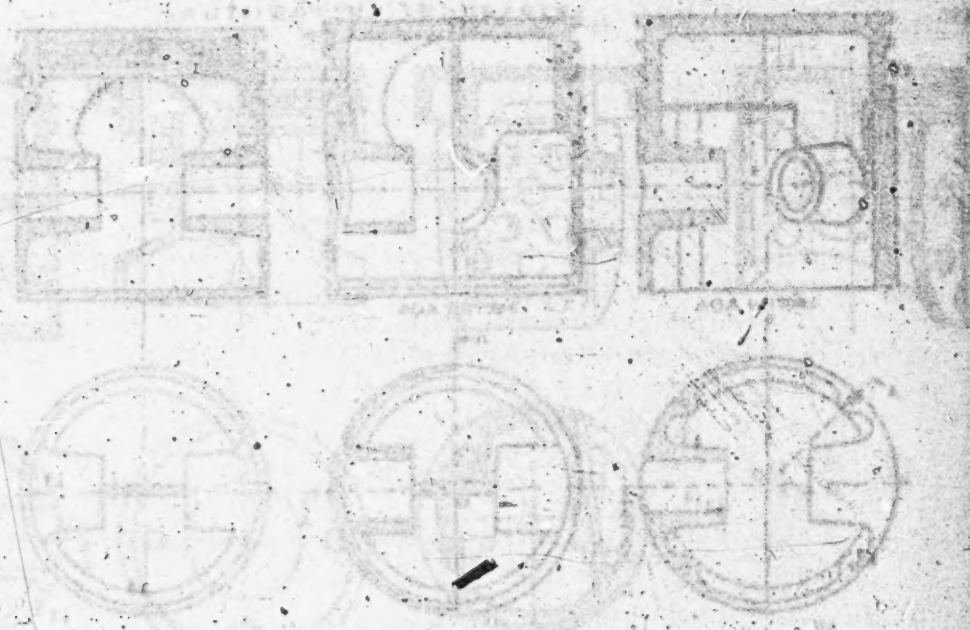
This lock holds the steering gear fast in any angle, and therefore avoids driving of the front wheels. As you can see from the illustration, it does not interfere with [illegible] and the [illegible] of the steering wheel. The object of the lock, of course, is to prevent theft of the car.

In the illustration, A is a 10 machine bolt which holds the ring which is the proper position by screwing on the nut, B is a [illegible] and by turning and [illegible] device C and D. C is a steel ring attached to the ring A and by the spring at E. D is the spring [illegible] is rigidly or with [illegible] and F is the machine-steel [illegible], screwed into the tube C and secured with a [illegible]



Miller Steering Gear Lock

1670



DEFENDANTS' EXHIBIT 4-H(1).
Prior Art Patent.
U. S. Patent No. 700,309, May 20, 1902,
To H. E. Ebbs.
Piston for Gas or Other Motors.
(Filed January 27, 1934.)

1672

No. 700,309. Patented May 20, 1902.

H. E. EBBS.

PISTON FOR GAS OR OTHER MOTORS.

(Application filed Dec. 19, 1899.)

(No Model.)

Fig.1

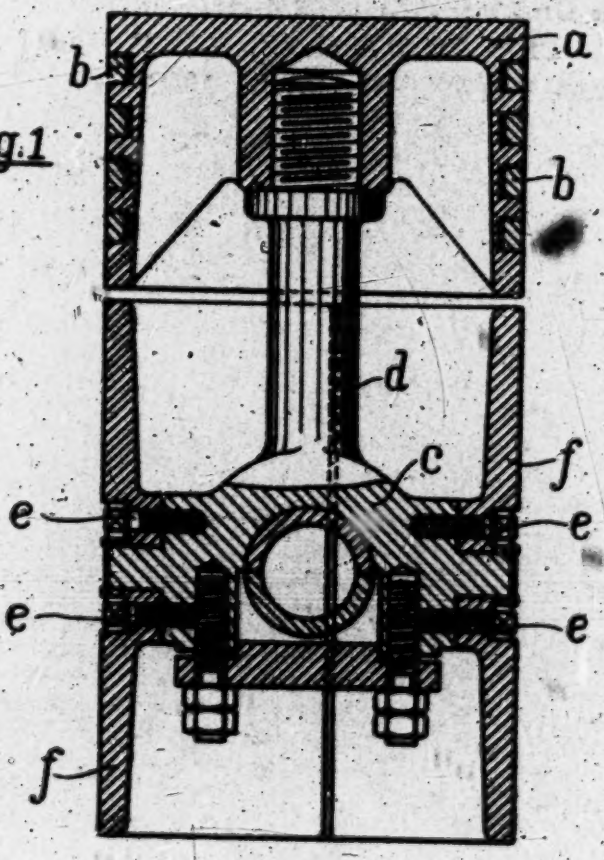
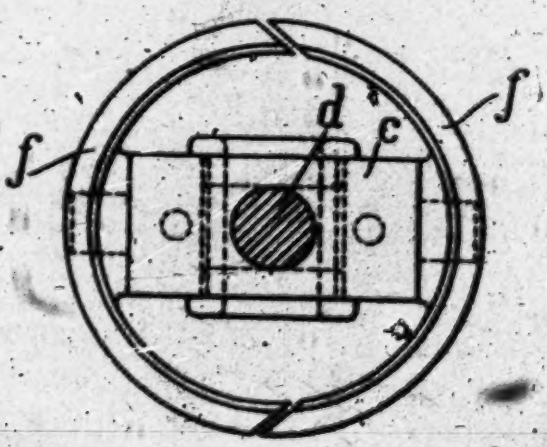


Fig.2



WITNESSES:

INVENTOR

ATTORNEYS

UNITED STATES PATENT OFFICE.

HERMANN EDGAR EBBS, OF NUREMBERG, GERMANY, ASSIGNOR TO THE FIRM OF VEREINIGTE MASCHINENFABRIK AUGSBURG UND MASCHINENBAUGESELLSCHAFT NÜRNBERG A.-G., OF NUREMBERG, GERMANY.

PISTON FOR GAS OR OTHER MOTORS.

SPECIFICATION forming part of Letters Patent No. 700,209, dated May 20, 1902.

Application filed December 19, 1898. Serial No. 740,205. (No model.)

To all whom it may concern:

Be it known that I, HERMANN EDGAR EBBS, a subject of the Queen of Great Britain, residing at Nuremberg, Bavaria, German Empire, have invented certain new and useful Improvements in Pistons for Gas or other Motors, of which the following is a full, clear, and exact description.

The present invention relates to pistons for gas and other motors; and it consists of the details of construction hereinafter set forth, and particularly pointed out in the claims.

In order to render the present specification easily intelligible, reference is had to the accompanying drawings, in which similar letters of reference denote similar parts throughout both views.

Figure 1 is a longitudinal section through the center of the piston, and Fig. 2 a front elevation of the same.

In pistons for gas and petroleum motors the front part of the piston only has usually been employed to guide the same in the cylinder, the rear part being generally of a slightly smaller diameter and having the piston-rings. It has been found that the front part of the piston, which in pistons serving as cross-head at one and the same time serves to guide the whole piston in the cylinder, easily gets worn out, whereupon it becomes necessary to replace the whole piston with a new one. Then again the large area connecting the rearward and forward piston parts causes the distribution of very considerable heat from the rear to the fore part of the piston, thus considerably increasing the amount of friction generated in the straight guiding of the fore piston part.

The object of the present invention is to obviate these disadvantages in that the front part of the piston which serves to guide the same in the cylinder is made entirely separate from the rear portion which serves to carry the packing-rings and to close gas-tight against the walls of the cylinder.

According to the present invention the piston proper, *a*, is provided with the packing-rings *b*, while the front or guiding part *f* thereof is attached to the rear part by means of a short shaft *d*, which may be screwed into or otherwise attached to the piston proper, *a*. The part *f* is advantageously made of the two semicylindrical halves, as shown at Fig. 2, and contains the cross-head *c* therein, the said halves being advantageously attached to the cross-head by means of the screws *e e*.

The particular construction of the parts and the method of attaching them together is indifferent and may be carried out in any suitable manner.

I claim as my invention—

1. In combination, the cross-head, the semi-cylindrical removable and interchangeable guiding portions carried thereby, a short shaft integral with said cross-head extending axially rearward therefrom, a rear piston portion threaded on said shaft and packing-rings carried thereby, substantially as described.

2. In combination, a cross-head, a guiding and a packing cylinder, said guiding-cylinder consisting of a plurality of segmental sections removably secured to the cross-head and a connection between the packing-cylinder and the cross-head, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

HERMANN EDGAR EBBS.

Witnesses:

ANDREAS STICH,

OSCAR BOCK.

1674

DEFENDANTS' EXHIBIT 4-H(2).
Prior Art Patent.
U. S. Patent No. 908,569, Jan. 5, 1909,
To F. D. Howe.
Engine.
(Filed January 27, 1934.)

1676

F. D. HOWE.

ENGINE.

APPLICATION FILED JUNE 26, 1908.

908,569. Patented Jan. 5, 1909.

Fig. 1.

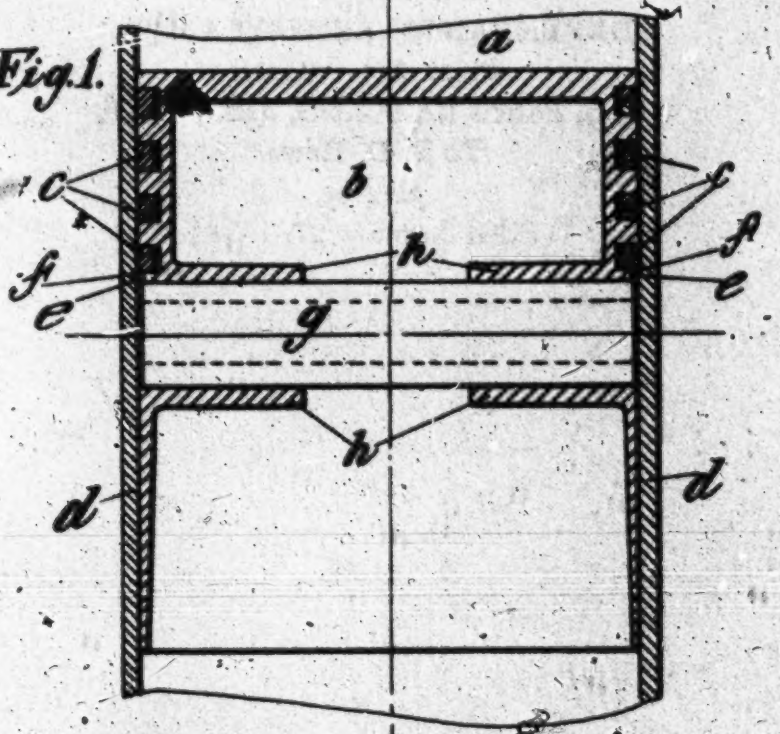


Fig. 2.

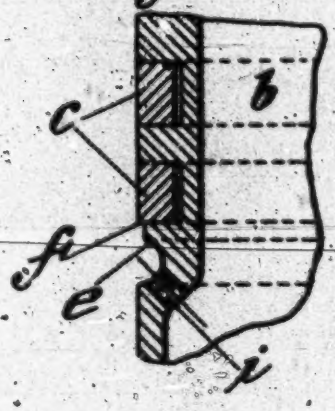
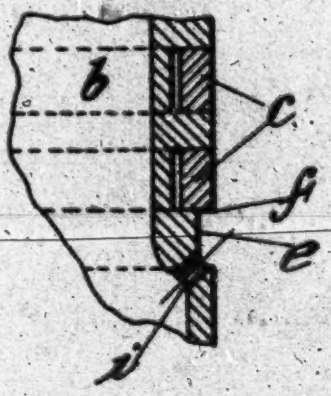


Fig. 3.



WITNESSES:

J. Ward E. Varney

Theodore Gottmayer

INVENTOR

Frank D. Howe

BY

Redington Dodge & Gridley

ATTORNEYS

UNITED STATES PATENT OFFICE.

FRANK D. HOWE, OF PORT WASHINGTON, NEW YORK.

ENGINE.

No. 906,589. Specification of Letters Patent. Patented Dec. 8, 1908.

Application filed June 22, 1908. Serial No. 439,662.

To all whom it may concern:

Be it known that I, FRANK D. HOWE, a citizen of the United States, residing in Port Washington, county of Nassau, and State of New York, have invented certain new and useful Improvements in Engines, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

It is desirable particularly in internal combustion engines, to reduce to a minimum the amount of lubricating oil which commonly works by the piston into the combustion chamber. If some means are not provided toward this end, the film of oil around the piston upon the walls of the cylinder gradually works inwardly into the combustion chamber where it becomes more or less carbonized and volatilized, to a considerable extent with the [illegible] of the engine.

A common way of lubricating the cylinder of an explosive engine, and particularly an upright explosive engine, is that known as the splash method, in which a quantity of lubricating oil is [illegible] the closed crank case of the engine, so that the crank, revolving therein, will splash the oil against the open end of the cylinder, thereby forming a film of oil on the interior surface of the same. It frequently happens, however, that this film of oil, which of course is constantly renewed by the splashing, is carried on past the piston and the oil caused to accumulate in the upper part of the cylinder, where it is decomposed or carbonized by the heat produced by the explosions, forming deposits and impairing the operation of the engine, chiefly by carbonizing the spacker or packing and thus interfering with ignition. It is necessary, of course, that a certain quantity of oil be spread over the cylinder surface, for lubrication, and hence it is only the excessive traveling or creeping of the oil that should be prevented.

The object of the present invention is to provide a very simple means for avoiding this objection above mentioned, which means shall not necessitate the addition of extra parts or involve any considerable expense in its embodiment or its service.

Broadly considered the invention consists in providing means upon the piston such as a sharp edge for scraping off the film of oil around the piston upon the walls of the cylinder as the piston moves forward, and a recess in the piston adjacent to said edge, whereby, as the film of oil is sheared off it will be deposited in the recess whence it may find its way back to the source of lubrication or elsewhere through a suitable relief.

The invention is illustrated in the drawings as embodied in an engine having a vertically working piston, and in said drawings, Figure 1 is a view in vertical central section of the engine showing the piston in side elevation, and, Figs. 2 and 3 are detail views in central vertical section through two pistons showing modifications.

The working cylinder, or more specifically, if the engine be of the internal combustion type, the combustion chamber is indicated by the letter 4 and the piston which, as shown, is of the ordinary trunk variety, by the letter 5. The piston may be provided with any suitable number of packing rings 6 which are sprung into peripheral grooves in the piston so as to bear resiliently against the walls of the cylinder, forming the working chamber. Just ahead of one of the rings, preferably the foremost ring as shown, I cause a groove 7 to be formed which may extend around the entire piston, and the edge of this ring, the edge toward the forward end of the piston, is made quite sharp, corresponding with the recess 7 is a relief chamber, which as shown in Fig. 1 is formed by the space formed between a groove 8 to which the piston may be provided and the bore 9 in the piston for such wrist pin. In Fig. 2 channels 7 are illustrated connecting the recess 7 with the interior of the piston to afford a relief for the recess. It will be obvious that a relief for the recess may be provided in various ways.

In operation, the forward movement of the piston, that is its movement away from or out of the cylinder, causes the sharp edge of the ring adjacent to the recess 7 to shear off the film of oil around the walls of the cylinder and to deposit such oil in the recess 7. Thence it finds its way back through the relief to the source of lubrication or to some other convenient depository. In practice, the lubrication of a vertical engine is often depended upon by the piston upon the walls of the cylinder. In such a case, the oil escaping through the relief can obviously be allowed to drip

back through the interior of the piston into the oil beneath.

It is obvious that the improvements may be embodied in other ways than those shown, described or referred to herein.

I claim as my invention:

1. In an engine, the combination with the engine cylinder, of a piston therein, a piston ring pressing against the walls of the cylinder, a recess to receive oil from the inner surface of the cylinder, and a relief for the recess.

2. In an engine, the combination of a working chamber, a piston therein having a peripheral recess, and a ring in the recess pressing against the walls of the chamber, said piston having a second recess arranged next to the ring so as to receive the oil scraped by the ring from the walls of the working chamber.

3. In an engine, the combination of a working chamber, a piston therein having a peripheral recess, a ring in the recess pressing against the walls of the chamber, said piston having a second recess adjacent to the ring, and a relief for said second recess.

4. In an engine, the combination of a working chamber, a piston therein having a peripheral recess, a ring in the recess having a sharp edge toward the forward end of the piston, said piston having a second recess adjacent to the ring, and a relief for said second recess into the interior of the piston.

5. In an engine, the combination of a working chamber, a hollow piston therein having a peripheral recess, and a ring in the recess having a sharp edge toward the forward end of the piston, said piston having a second recess extending around its periphery just ahead of the ring, and channels connecting said recess with the hollow of the piston.

6. In an engine, the combination with the engine cylinder, of a piston therein, a piston ring pressing against the walls of the cylinder, a recess next to the ring to receive oil from the inner surface of the cylinder, and a relief for the recess.

7. In an engine, the combination with the engine cylinder, of a piston therein, and a sharp edge extending around the periphery of the piston adapted to remove the oil from the inner surface of the cylinder as the piston moves in a direction away from the cylinder or out of the cylinder.

8. In a vertical engine, the combination with the cylinder, of a piston working therein, and provided with means for removing oil from the inner surface of the cylinder as the piston moves downwardly and discharging it from a point removed from said surface.

9. In an engine, the combination with the engine cylinder, of a piston therein having a wrist-pin, a piston ring pressing against the walls of the cylinder, a recess to receive oil from the inner surface of the cylinder, and a relief for the recess around the wrist-pin.

10. In an engine, the combination with the engine cylinder, of a piston therein, a piston ring, a recess into which the ring is adapted to scrape oil, and a relief for the recess

This specification signed and witnessed this 20th day of June, A. D., 1906.

FRANK D. HOWE.

Signed in the presence of—
HOMER H. SNOW,
FRANCES E. VARNEY.

DEFENDANTS' EXHIBIT 4-H(3).
Prior Art Patent.
U. S. Patent No. 1,031,212, July 2, 1912,
To E. Van Bever.
Expansible Piston.
(Filed January 27, 1934.)

1680

E. VAN BEVER.

EXPANSIBLE PISTON.

APPLICATION FILED SEPT. 18, 1911.

1,031,212. Patented July 2, 1912.

Fig. 1.

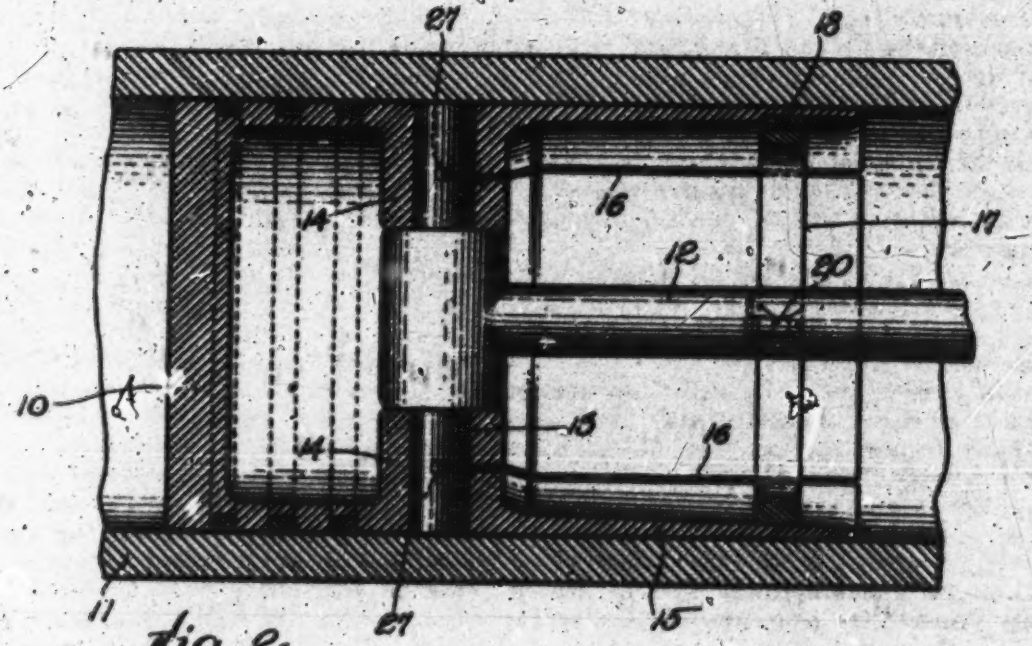


Fig. 2.

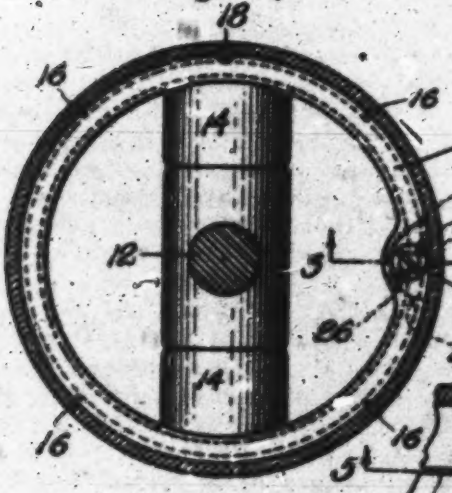


Fig. 4

Fig. 3.

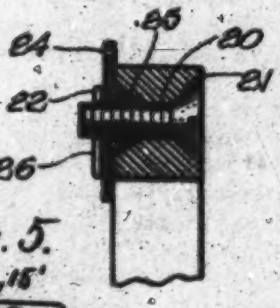


Fig. 5.

Witnesses:
C. L. Roger
Edward Macdonald

Inventor:
Edmond Van Bever,
by Geo. S. Maxwell,
Attorney.

UNITED STATES PATENT OFFICE.

EDMOND VAN BEVER, OF WATERTOWN, MASSACHUSETTS.

EXPANSIBLE PISTON.

1,031,212. Specification of Letters Patent. Patented July 2, 1912.

Application filed September 18, 1911. Serial No. 649,899.

To all whom it may concern:

Be it known that I, EDMOND VAN BEVER, a citizen of the United States, and resident of Watertown, county of Middlesex, Commonwealth of Massachusetts, have invented an Improvement in Expansible Pistons, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to pistons and, while applicable to other and more general uses, is especially designed for use in gas engine construction.

As is well known, the ordinary engine piston or plunger, though it may have been originally formed to closely fit its cylinder, after a period of use wears down to a certain extent and this, along with the wear of the cylinder, makes the piston a loose fit in the cylinder so that it tends to have some small lateral chucking play therein, which is only imperfectly prevented by the packings. This looseness of the piston in its cylinder tends to the premature destruction of the packing rings, as well as requiring special attention to the fitting of these.

The present construction provides a piston formed so as to be expansible from within to take up for the small diminution in its diameter due to wear, so that, even after a considerable period of use, its peripheral dimension may be the same as at the beginning.

The invention will be better understood from the following detailed description taken in connection with the accompanying drawings and will thereafter be pointed out in the appended claims.

Referring to the drawings, Figure 1 is a central longitudinal section showing a piston wherein my invention is carried out, a portion of the cylinder being shown broken away. Fig. 2 is a transverse section taken at the right of Fig. 1, portions of the piston being shown in elevation. Fig. 3 is a detail section on line 3—3 of Fig. 2. Fig. 4 is a fragmentary sectional detail showing another form of expanding mechanism, and Fig. 5 is a section on line 5—5 of Fig. 4.

The piston 10, usually of cast iron, is shown as of the integral hollow shell type with its outer end closed and is fitted to the cylinder 11 and united to a connecting rod 12 by wrist pin 13 fitted to sockets in bosses 14 projecting inward from the hollow shell intermediate of its length. The hollow shell of the piston, as is usual, extends rearwardly for some distance from the wrist pin connection as seen at 15, this rearwardly extending portion being slightly tapered so as to terminate in a relatively thin inner extremity. In the practice of my invention this hollow shell, for a considerable distance from its inner end, is divided into a number of sections, shown as four, by lengthwise slits 16. These slits, which, in the illustrative embodiment shown, extend substantially to the wrist pin connection, though the exact length thereof is not material, may be readily formed by sawing the piston shell with an ordinary metal saw. These sectional portions have a certain amount of springing capacity which need only be very slight for the present purpose, and as a means for expanding them outward to the small extent necessary, I provide an expanding ring 17 fitted into the piston sleeve and held from casual displacement by means shown as a screw bolt 18 tapped in a hole partly in the ring and partly in the piston shell. The ring 17 is divided at the point 19 and the abutting ends at this point are adapted to be forced apart by a screw bolt 20 fitted to a hole formed in the abutting ends, this bolt having a conical head 21 and having fitted thereto a nut 22 with a conical head 23. Thus as the nut 22 is screwed up on the bolt 20, the conical portions 21, 23 force the abutting ring ends apart, causing expansion of the ring and corresponding expansion of the sectional portions of the piston shell. As a means for preventing casual displacement of the nut 22, it is formed with an abutment plate 24 flattened off, as seen at 25 in fig. 2, the inside of the piston shell. The screw bolt 20 is likewise prevented from casual displacement after adjustment by having a cotter pin 26 passed through a transverse aperture in its end and with its extremity in position to press against the inside of the piston shell, so that both the screw bolt and its nut are thus held against movement, and any desired expanding adjustment of the piston ends of the sections is reliably maintained.

The form of expanding mechanism just described is especially applicable for equipping worn pistons with my invention, since it does not require any machining of the piston. In the case of new pistons which can be conveniently machined the expand-

ing device of Fig. 4 and Fig. 5 may be advantageously employed. As shown in these figures, the inner end 15' of the piston, which is provided with slots 16 as before described, has an internal tapered thread formed therein as seen at 28, and engaging with this thread is a ring 17' having a correspondingly tapered and threaded outer periphery. This ring may be screwed into the piston end to expand the sectional portions thereof to the extent desired, and as a suitable means for preventing the working out of this ring, I provide radial holes 29 therethrough at intervals through one or more of which a cotter pin 30 is passed so that its head extends up into a slot 16 without reaching the periphery of the piston, while its inwardly projecting ends may be bent over the ring to prevent dislodgment. Thus the head of the cotter pin engaging with the walls of the slot 16 effectively prevents any turning of the ring and holds the parts in precise adjusted position. The resiliency effected by the slits 16 may be somewhat enhanced if desired by the drilling of holes 27 in the extremities of these slits, though this is not essential to the effective carrying out of the invention.

It will be understood that while a cast iron piston of usual form is shown for illustrative purposes in setting forth the principles of my invention, the invention is not limited to this one form of piston, but may be carried out with various different piston and plunger constructions. The invention is likewise adapted for use in the production of new pistons or for the refitting of old and worn plungers. In the case of a plunger worn by use, all that is necessary is to remove it, saw the slits 16 from its inner end, select an expanding ring of proper size, and fit it to the inside of the shell, this fitting being facilitated by the usual tapering form of the standard types of hollow shell piston from the wrist pin inward.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A piston formed with a hollow shell integral with the main body thereof, there being slits lengthwise through the shell from its inner end, and means for expanding the sectional portions thus formed to take up for wear.

2. A piston formed with a hollow shell integral with the main body thereof, there being a plurality of equally spaced apart lengthwise slits through the inner end portion of the shell, and an internal expander for the sectional shell portions thus formed.

3. A piston, having an inwardly extending shell portion integral therewith with a plurality of equally spaced apart lengthwise extending slits therethrough, and an internal expander for springing out and holding in expanded adjustment the sectional shell portions thus formed.

4. A piston, having a wrist pin fitted to inwardly projecting bosses thereof, and a shell portion extending inwardly from said wrist pin integral with the body of the piston, said shell portion being sectioned by a plurality of equally spaced apart slits into segmental portions, and an internal expanding ring fitted to the interior of said sectional shell portions.

5. A hollow shell piston, having inwardly extending bosses with a wrist pin fitted therein, and a shell portion integral with the piston body extending inwardly from said wrist pin, said integral shell portion having a lengthwise extending slit therethrough, and an internal expander fitted to expand said inwardly extending shell portion.

6. A piston, comprising an integral hollow shell portion with a slot extending lengthwise therethrough for a part of its length, and means for expanding said shell portion to take up for wear.

7. An integral hollow shell piston, having slits lengthwise through the shell from its inner end, and means for expanding the sectional portions thus formed to take up wear, said means consisting in a tapered threaded ring fitted to a tapered threaded seat in the end of the piston.

8. An integral hollow shell piston, having slits lengthwise through the shell from its inner end, and means for expanding the sectional portions thus formed to take up wear, said means consisting in a tapered threaded ring fitted to a tapered threaded seat in the end of the piston, said ring having a radially extending hole therethrough with a pin passed through said hole and engaging with the walls of one of said slits.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

EDMOND VAN BEVER.

Witnesses:
CLYDE L. BOWMAN,
EDWARD MAXWELL.

DEFENDANTS' EXHIBIT 4-H(4).

Prior Art Patent.

U. S. Patent No. 1,092,870, April 14, 1914.

To E. O. Spillman & L. P. Moore.

Piston for Explosion Engines for Motors.

(Filed January 27, 1934.)

1684

E. O. SPILLMAN & L. P. MOORES.

PISTON FOR EXPLOSION ENGINES OR MOTORS.

APPLICATION FILED JULY 10, 1913.

1,092,870. Patented Apr. 14, 1914.

Fig. 1.

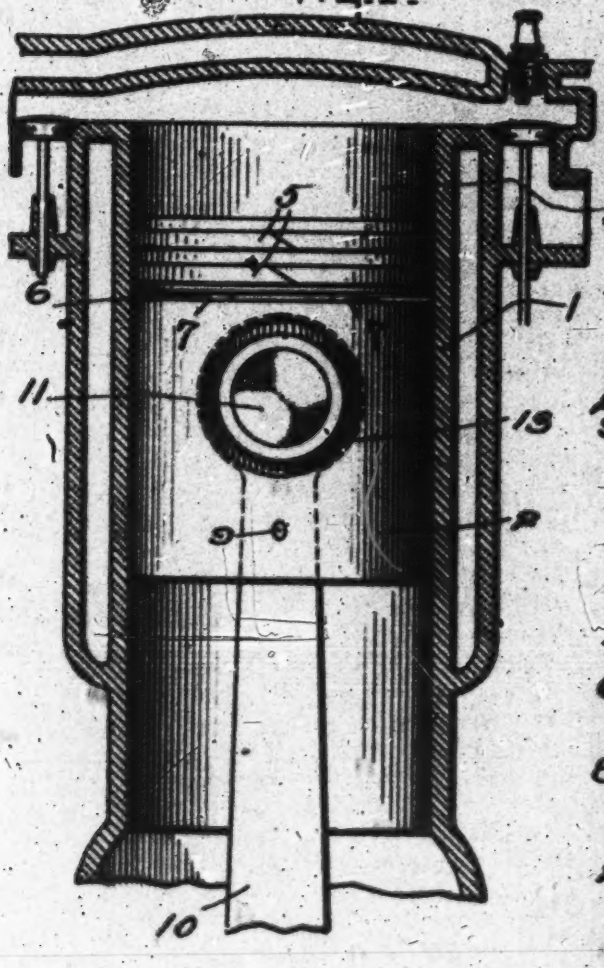


Fig. 2.

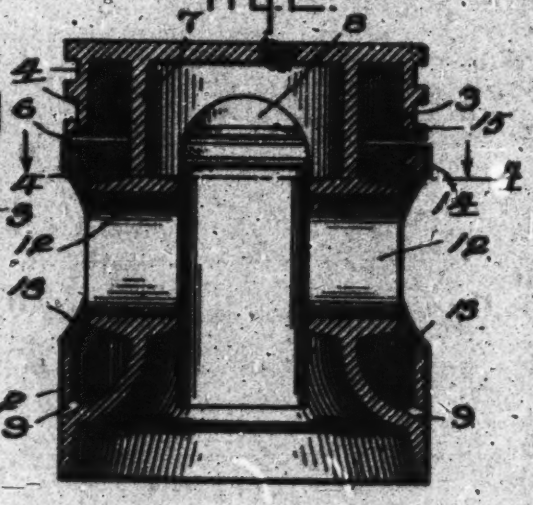


Fig. 3.

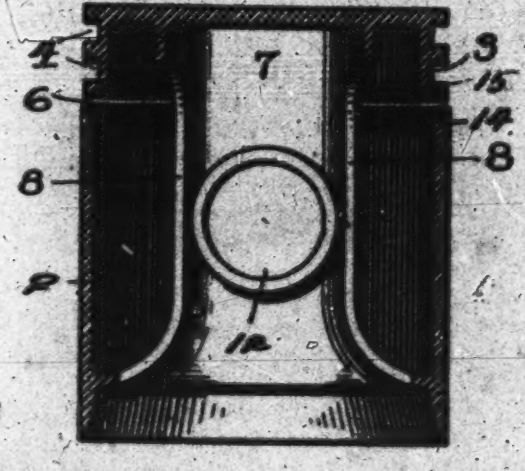
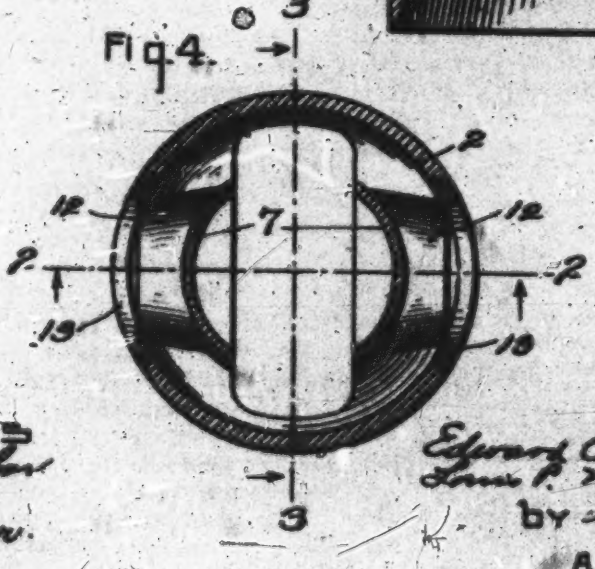


Fig. 4.



WITNESSES
M. Ray Faylor
Walter O. Leyer.

INVENTORS
Edward O. Spillman.
Louis P. Moores.
by Leyer & Popp
ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD O. SPILLMAN AND LOUIS P. MOORES, OF NORTH TONAWANDA, NEW YORK.

PISTON FOR EXPLOSION ENGINES OR MOTORS.

1,092,870. Specification of Letters Patent. Patented Apr. 14, 1914.

Application filed July 10, 1913. Serial No. 778,737.

To all whom it may concern:

Be it known that we, EDWARD O. SPILLMAN and LOUIS P. MOORES, citizens of the United States, residing at North Tonawanda, in the county of Niagara and State of New York, have invented new and useful Improvements in Pistons for Explosion Engines or Motors, of which the following is a specification.

This invention relates more particularly to the pistons of explosion engines or motors.

As ordinarily constructed, the head and the body of the piston are integral or continuous, and the head, which is subjected to the full heat of the gas, transmits the same to the body. The resulting expansion of the body causes the same to bind in the cylinder, scoring or grooving the latter in time, or if the piston-body is fitted loosely enough to avoid scoring, it rattles in the cylinder and fails to compress the explosive mixture to the proper degree, impairing the efficiency of the motor.

It is the object of our invention to so construct the piston that the conduction or transmission of heat from the head to the body or guide portion of the piston is reduced to a minimum. Expansion of the body is thus diminished practically to that of the cylinder and the body may be closely fitted therein, thereby obtaining the maximum efficiency of the motor, avoiding rattling of the piston, and at the same time preventing scoring of the cylinder.

In the accompanying drawings: Figure 1 is a sectional elevation of a motor provided with the improved piston. Figs. 2 and 3 are longitudinal sections of the piston on the correspondingly numbered lines in Fig. 4, the packing rings being omitted. Fig. 4 is a transverse section thereof on line 4—4, Fig. 2.

Similar characters of reference indicate corresponding parts throughout the several views.

1 indicates a motor cylinder of any ordinary construction, the cylinder forming no part of our invention.

2 indicates the body or guide-portion of the piston, and 3 the head or front portion thereof which is shown as having the customary annular grooves 4 for receiving the usual packing rings 5.

The wall of the head, instead of being integral or continuous with the wall of the body, is isolated or separated from it by a gap or space 6 of suitable width to avoid or minimize transmission of the heat from said head-section to said body or guide-section and thereby prevent objectionable expansion of the latter. This gap may be produced by a saw cut made after machining and before grinding the piston.

The head and guide sections of the transversely-divided piston are tied together by any suitable connection, that shown in the drawings consisting of a tubular longitudinal web 7 arranged within the hollow sections and cast in one piece therewith.

In the construction illustrated in the drawings, the web is separated from the surrounding walls of the head and guide sections by a comparatively wide space, and the upper end of this connecting web joins the back of the head section, while its lower end joins the guide-section near its lower end or at a point remote from the non-conducting gap 6, whereby the amount of heat transmitted through the web from the head to the guide-section is reduced to a negligible degree, not only on account of the remoteness of the lower end of the web from the gap, but because the web is constantly cooled by the large volume of oil in the crank case. To permit circulation of the lubricant through the web and also reduce the weight of the piston, the web may be provided in opposite sides with openings 8, but these openings are not essential and the web may be imperforate, if desired. Oil holes or channels 9 may also be extended through the guide-section above the lower end of the web, as shown.

10 indicates the usual connecting rod of the motor and 11 the wrist-pin journaled in suitable bearings 12, which in the preferred construction shown, are integral with the web 8, as seen in Fig. 2. Opposite and in line with these bearings the guide-section may be provided with openings 13 for lubricating purposes.

The guide-section 2 is of the proper diameter to closely fit the cylinder and obtain the maximum efficiency of the motor, while the head-section 3 is sufficiently smaller in diameter than the guide-section to remain out of contact with the cylinder-wall under the maximum expansion of the head-section; this close fit of the guide-section being permitted without danger of scoring the cylinder, by reason of the isolation of the wall

or skirt from the wall of the head-section, which prevents undue expansion of the guide-section, as hereinbefore described. The body-section is long or extensive relative to the head-section and acts as a guide or cross-head therefor which receives all the side thrust of the connecting rod and keeps the head-section out of contact with the cylinder-wall at all times, causing it to operate freely and noiselessly.

As shown, the guide-section is extended forwardly or upwardly beyond the wrist-pin and in practice preferably terminates about a sixteenth of an inch short of the inner end of the head-section to leave the isolating gap 6.

This improved construction combines the important advantages of maximum engine efficiency, smooth and noiseless action of the piston and non-scoring of the cylinder; and these are obtained by simple means which do not materially increase the cost of the piston.

Preferably the upper edge of the piston body is beveled or inclined toward the axis of the piston, as shown at 14, while the lower edge of the piston-head is beveled in the reverse direction, as shown at 15. By this construction, on the upward stroke of the piston the lower beveled edge 14 deflects or crowds the surplus oil back into the piston, while on its downward stroke, the upper beveled edge 15 performs the same function.

We claim as our invention:

1. A piston comprising a head-section, a guide-section having its peripheral wall isolated from the corresponding wall of the head-section by a non-conducting gap extending practically around the piston, the guide-section being relatively long to form a cross head, and means connecting said sections.

2. A piston comprising a head-section, a guide-section forming a cross head and having its wall isolated from the wall of the head-section by a narrow non-conducting gap, and means connecting said sections.

3. A piston comprising a head-section, a separate guide-section therefor, means connecting said sections, and a wrist-pin bearing, the wall of the guide-section extending forwardly beyond the wrist-pin bearing and terminating short of said head-section to leave a non-conducting gap between said sections.

4. A piston comprising a head-section, a guide-section having its wall isolated from the wall of the head-section by a narrow non-conducing gap, and a web arranged lengthwise within said guide and head-sections and connecting the same, said web being located at a distance from the walls of said sections.

5. A piston comprising a head-section, a relatively long guide-section having its wall isolated from the wall of the head-section by a non-conducting gap, and an internal web connecting said sections and joining the guide-section at a point remote from said gap.

6. A piston comprising a head-section, a guide-section isolated from the head-section by a non-conducting gap, said guide-section being provided in opposite sides with openings, an internal web connecting said head-section with the guide-section, and wrist-pin bearings mounted on said web in line with said openings and isolated from the wall of the guide-section and the edges of said openings.

7. A piston comprising a guide-section, a head-section isolated from the guide section by a non-conducting gap, and a tubular web arranged within said sections and connecting the same, the web being provided with one or more oil openings.

8. A piston comprising a guide-section, a head-section isolated from the guide-section by a non-conducting gap, and an internal tubular web connecting said sections and separated from the surrounding piston-wall, said wall being provided with oil holes.

9. A piston comprising a guide-section, a head-section separated therefrom by a gap, and means within the piston connecting said sections, that end of the guide-section forming the rear edge of said gap being provided with an oil deflecting face.

10. A piston comprising a guide-section, a head-section separated therefrom by a gap, and means within the piston connecting said sections, that end of the guide-section forming the rear edge of said gap being beveled to slope toward the axis of the piston.

11. A piston comprising a guide-section, a head-section separated therefrom by a gap, and means within the piston connecting said sections, the adjacent ends of the said sections being beveled inwardly in opposite directions.

Witness our hands this 11th day of July, 1913.

EDWARD O. SPILLMAN.
LOUIS P. MOORES.

Witnesses:
C. F. Griffin,
E. M. Graham.

DEFENDANTS' EXHIBIT 4-H(5).
Prior Art Patent.
U. S. Patent No. 1,153,902, Sept. 21, 1915,
To G. E. Franquist.
Piston.
(Filed January 27, 1934.)

1688

G. E. FRANQUIST.

PISTON.

APPLICATION FILED AUG. 1, 1914.

1,153,902.

Patented Sept. 21, 1915.

Fig. 1.

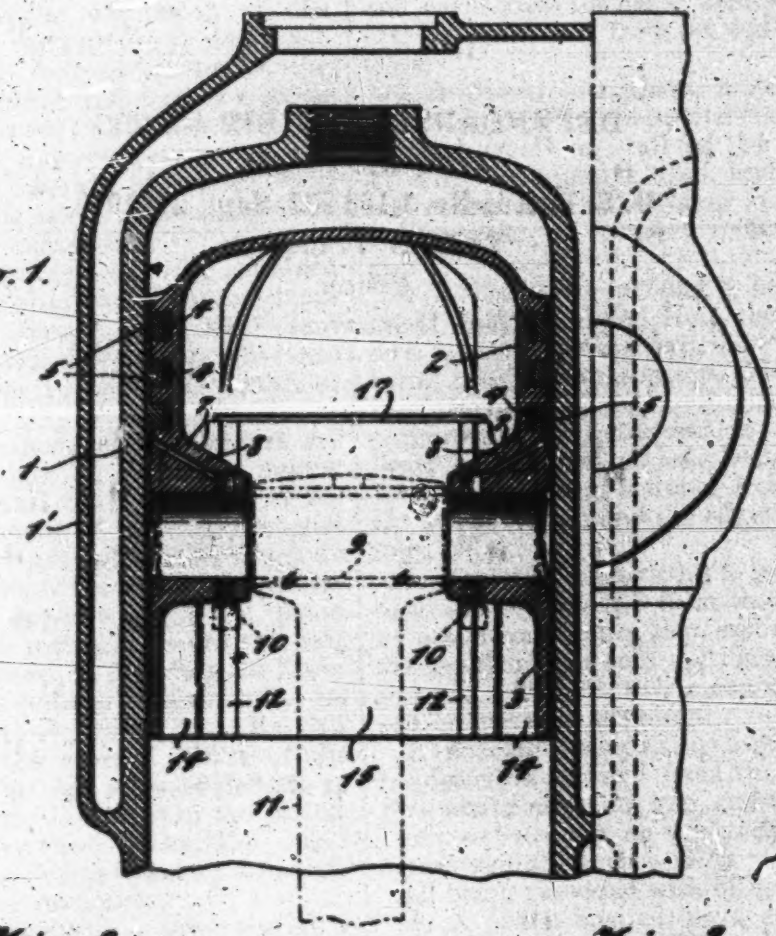


Fig. 2.

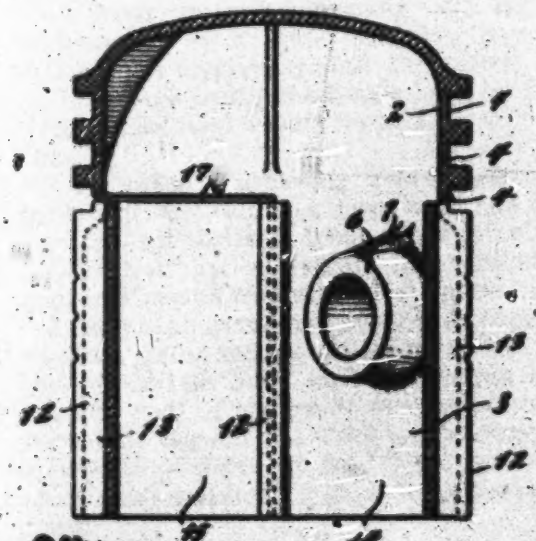
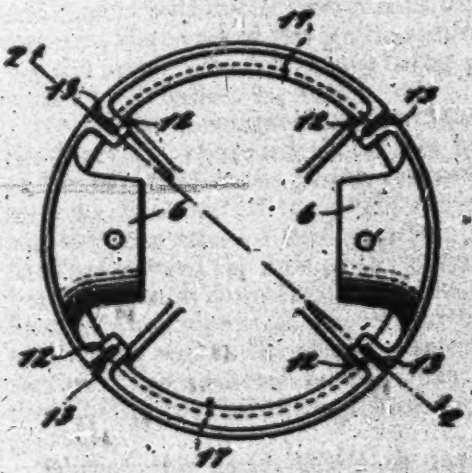


Fig. 3.



Witnesses:

Inventor

Gustave E. Franquist.

Their Attorneys

UNITED STATES PATENT OFFICE.

GUSTAVE E. FRANQUIST, OF NEW BRUNSWICK, NEW JERSEY.

PISTON.

1,153,902. Specification of Letters Patent. Patented Sept. 21, 1915.

Application filed August 1, 1914. Serial No. 854,494.

To all whom it may concern:

Be it known that I, GUSTAVE E. FRANQUIST, a citizen of the United States, residing at New Brunswick, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Pistons, of which the following is a full, clear, and exact description.

This invention relates to internal combustion engines and has for its primary object the provision of a piston which will eliminate the piston clatter at all speeds and temperatures of the motor.

With this object in view, the invention consists of a piston having a sleeve which is circumferentially compressible and is adapted to have a snug sliding fit in the cylinder when cold, so that upon an expansion of the piston the sleeve will automatically yield sufficiently to prevent the piston from sticking in the cylinder, and after the cylinder has also expanded will again automatically resume substantially its normal size and take up the free play between the cylinder and piston, which would otherwise occur.

The invention also consists of the constructions which will be hereafter described in detail and particularly pointed out in the appended claims.

In the accompanying drawings Figure 1 shows a central longitudinal section through a cylinder and a piston constructed in accordance with the principles of this invention; Fig. 2 is a central longitudinal section of the piston on the line 2—2 shown in Fig. 3; and Fig. 3 is a bottom plan.

Referring to the drawings, 1 designates broadly the cylinder and 1' the water jacket of an internal combustion engine, the particular construction of which forms no part of the present invention. The piston shown may be regarded as comprising two parts, a head 2 and a sleeve 3, the head extending rearwardly to the rear end of the rearmost piston ring, while the remaining portion of the piston constitutes the sleeve. The head of the piston is provided with circumferential grooves 4 in which the piston rings 5 are adapted to be loosely fitted. Extending inwardly from the inner peripheral surface of the sleeve at diametrically opposed points are the piston pin bosses 6. These bosses are provided with ribs 7 through which an oil groove or hole 8 is bored in order to supply the lubricating material to a crank pin 9, which is suitably fitted in journals provided in these bosses, and is held in place therein by set screws 10. The pin 9 carries a connecting rod 11, the construction thus far described being typical of the ordinary hollow "trunk" piston.

As is the usual practice, the circumferential surface of the head of the piston, or that portion which lies between the piston rings, is machined so as to fit very loosely within the cylinder to permit an expansion of the piston when heated, and is usually from .010 to .090 of an inch less in diameter than the diameter of the cylinder. The piston rings are also fitted in the grooves to allow them to have some lateral movement. The head of the piston does not therefore serve to prevent the piston from rattling within the cylinder. It is necessary then to depend upon the sleeve of the piston to prevent the rattling or clapping of the piston within the cylinder and heretofore it has been customary to allow .002 to .006 free play between the sleeve of the piston and the cylinder to take care of the expansion of the piston before the cylinder walls become heated and to prevent the piston from sticking. After the engine has been running for a comparatively long period the cylinder walls expand, since the water in the jacket becomes heated and the same necessity for compensating for the expansion of the piston does not arise. When the sleeve fits as loosely as this within the cylinder, the piston will set up a rattling and clapping in the cylinder while it remains comparatively cool, i. e., while the motor is picking up, and against, after the cylinder has expanded so that the noise resulting therefrom may be heard by the driver and occupants of the car, if the internal combustion engine is used on an automobile. In order to prevent this rattling, it is proposed to use a piston having a sleeve which is circumferentially compressible so that it may be fitted snugly to the cylinder when cold and will automatically take care of the expansion of the piston. One embodiment of such a construction is shown in the drawings and will now be described. Projecting inwardly from the inner surface of the sleeve are longitudinal ribs 12 which preferably extend the entire length of the sleeve substantially parallel to the axis of the piston to a point on a level with the middle of the rearmost piston ring. Longitudinal slots 13 are cut in the outer surface of the sleeve and extend into these ribs, form-

ing the longitudinal grooves in the same. These slots divide the sleeve of the piston into longitudinal sections 14—14 and 15—15, the sections 14—14 carrying the piston pin bosses 6.

Circumferential slots 17—17 are cut in the outer surface of the sleeve in the sections 15—15 respectively, which slots extend to and join the longitudinal slots of 13, separating the longitudinal sections 15 from the head of the piston. The sections 14—14 which carry the piston pin bosses remain integrally connected to the piston head 2 and are relieved from a point on a level with the rearmost piston ring to a point below the piston pin bosses, approximately .005 of an inch on the side, to insure that upon the expansion of the piston the portion of the sleeve which carries the bosses will be prevented from sticking to the cylinder walls and causing either the motor to stop, or the breakage of the parts. In machining a piston of this character, the sleeve is given a relatively snug sliding fit within the cylinder even when cold; or in other words, the piston may be so accurately fitted to the cylinder that even when the piston is cold and the motor is starting there will be no rattling or undesirable noises produced by the actuation of the piston as the motor picks up and the temperature of the piston rises. Due to high temperature of the explosive gases the piston will commence to expand and the cylinder walls will therefore exert a pressure on the same which must be relieved in order to prevent the piston from sticking. It is obvious, however, that as the piston expands the longitudinal sections 15—15 which are separated from the head of the piston and the other portions of the sleeve, by the slots 13 and 17, will move inwardly under the pressure which is exerted on these sections by the cylinder walls until the slots 13 and 17 are closed. However, these slots are made sufficiently large to insure that this will not occur. The rear ends of the sections 14—14 will yield similarly to sections 15—15. It is obvious, then, that the only portions of the sleeve which cannot yield due to the pressure exerted by the cylinder walls on the expanding piston, are those portions of the sleeve opposite the piston pin bosses, and, as has already been stated, these portions of the sleeve are relieved .005 of an inch or more on the side so that there will be no liability of these portions of the sleeve sticking to the cylinder walls. The circumference of the piston will therefore be decreased the desired degree and the piston will operate within the cylinder without sticking, while maintaining a snug sliding fit therein which will prevent any rattling. After the motor has been running a comparatively long period of time the water in the jacket becomes heated and the cylinder expands, but any free play which would otherwise occur will be taken up by the sections of the sleeve which have been compressed resuming their normal position. Another advantage of a sleeve of this character is that in a multi-cylinder engine it is customary to connect one or more of the cylinders together, which, when the cylinders expand, will cause a distortion of the cylinders from a true circle in cross section. By making the sleeve compressible in the manner described, any distortion of the cylinder will cause one or more sections of the piston to yield and the sticking of the piston which has heretofore taken place will be obviated.

While I have shown a particular embodiment of my invention for constructing a piston which is adapted to be compressed circumferentially under the pressure which is exerted by the cylinder walls upon the sleeve of an expanding piston, yet it is not my intention to be limited to the particular construction shown, as the invention is capable of various modifications and it is my intention to cover broadly a piston having a sleeve which is adapted to be compressed circumferentially by the pressure exerted by the cylinder walls when the piston is expanding so that the piston will at all speeds and temperatures of the motor, have a snug sliding fit within the cylinder, which will prevent any rattling of the piston.

What I claim as new and desire to secure by Letters Patent, is:

1. In combination with the cylinder of an internal combustion engine, a piston comprising a head and a sleeve, said sleeve being automatically circumferentially compressible under the pressure exerted by the cylinder walls upon said sleeve when said piston expands.

2. In combination with a cylinder for an internal combustion engine, a piston comprising a head and a sleeve integral therewith, said sleeve being automatically compressible under the pressure exerted by the cylinder wall upon said sleeve when said piston expands.

3. A piston for internal combustion engines, having a head and a sleeve integral therewith, said piston having a circumferential slot therein separating a portion of said sleeve from said head and longitudinal grooves in said piston joining said circumferential slot, forming a section of said sleeve capable of bodily movement relative to the remainder of said sleeve.

4. A piston for internal combustion engines, comprising a head and a sleeve integral therewith, said piston having a circumferential slot therein dividing a portion of said sleeve from said head, longitudinal ribs formed on the inner peripheral surface of said sleeve, said ribs having longitudinal

grooves therein, joining said circumferential slot.

5. A piston for internal combustion engines, comprising a head and a sleeve integral therewith, said piston having a circumferential slot therein on a level with the rearmost piston ring, and ribs on the interior surface of said sleeve extending from the bottom of said sleeve to said slot, said ribs having longitudinal grooves therein joining the ends of said circumferential slot.

6. A piston for internal combustion engines, having a head and a sleeve, said sleeve having a rib on its inner surface extending the entire length of said sleeve, said sleeve having a slot therein extending into said rib and forming a longitudinal groove therein.

7. In an internal combustion engine, a cylinder, a piston therein comprising a sleeve having a snug sliding fit in said cylinder at all temperatures of said piston.

8. In an internal combustion engine, a cylinder, a piston comprising a head and sleeve, said sleeve having the portions thereof whose peripheral surfaces are in sliding contact with the walls of said cylinder automatically circumferentially compressible under the pressure exerted by said cylinder walls upon said sleeve when said piston expands.

9. In an internal combustion engine, a cylinder, a piston comprising a head and a sleeve integral therewith, said sleeve having the portions thereof whose peripheral surfaces are in sliding contact with the walls of said cylinder automatically circumferentially compressible under the pressure exerted by the said cylinder walls upon said sleeve when said piston expands.

10. In an internal combustion engine, a cylinder, a piston comprising a head and a sleeve, piston pin bosses projecting from the interior of said sleeve at a point adjacent the head of the piston, said sleeve comprising longitudinal sections some of which are bodily movable inwardly under the pressure exerted by the walls of said cylinder upon the same as the piston expands, and others of which, which carry the piston bosses, having the portions thereof extending outwardly from the piston bosses toward the free end of the sleeve also bodily movable and having their surfaces opposite the piston bosses of reduced diameter so that these portions are not in sliding contact with the walls of the cylinder.

11. In an internal combustion engine, a cylinder, a piston therefor, a head and a sleeve integral therewith, piston pin bosses extending from the interior surface of said sleeve, said piston having a circumferential slot therein on a level with the rearmost piston rim, and ribs on the interior surface of said sleeve extending from the bottom of said sleeve to said slot, said rib having longitudinal grooves therein joining the ends of said circumferential slot, and the external surface of said sleeve being relieved opposite the piston pin bosses whereby said portions of the sleeve do not contact with the cylinder walls.

In witness whereof I subscribe my signature in the presence of two witnesses.

GUSTAVE E. FRANQUIST.

Witnesses:
WALDO M. CHAPIN,
JULIA ZELENKO.

DEFENDANTS' EXHIBIT 4-H(6).

Prior Art Patent:

U. S. Patent No. 1,174,092, March 7, 1916,

To W. L. Schoengarth.

Adustable Gas Engine Piston.

(Filed January 27, 1934.)

1694

W. L. SCHOENGARTH.

ADJUSTABLE GAS ENGINE PISTON.

APPLICATION FILED OCT. 1, 1915.

1,174,092.

Patented Mar. 7, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

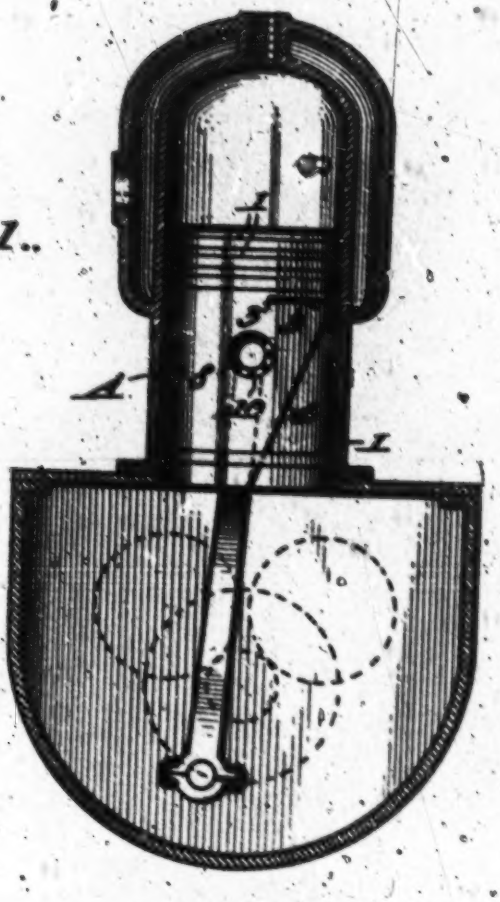


Fig. 4.

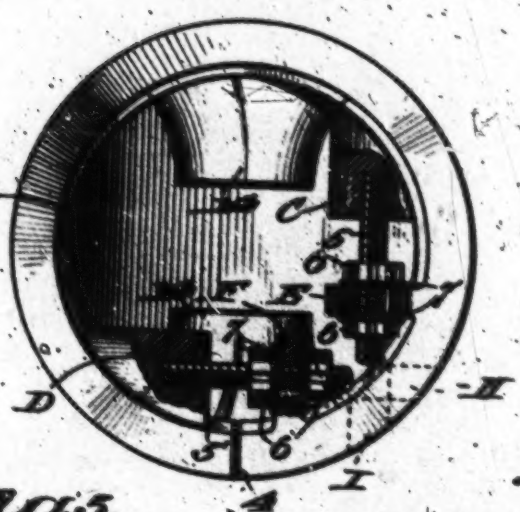


Fig. 5.

Inventor:
Walter L. Schoengarth
By Louis Bagge Jr
His Attys

1696

W. L. SCHOENGARTH.

ADJUSTABLE GAS ENGINE PISTON.

APPLICATION FILED OCT. 1, 1915.

1,174,092.

Patented Mar. 7, 1916.

2 SHEETS—SHEET 2.

Fig. 2.

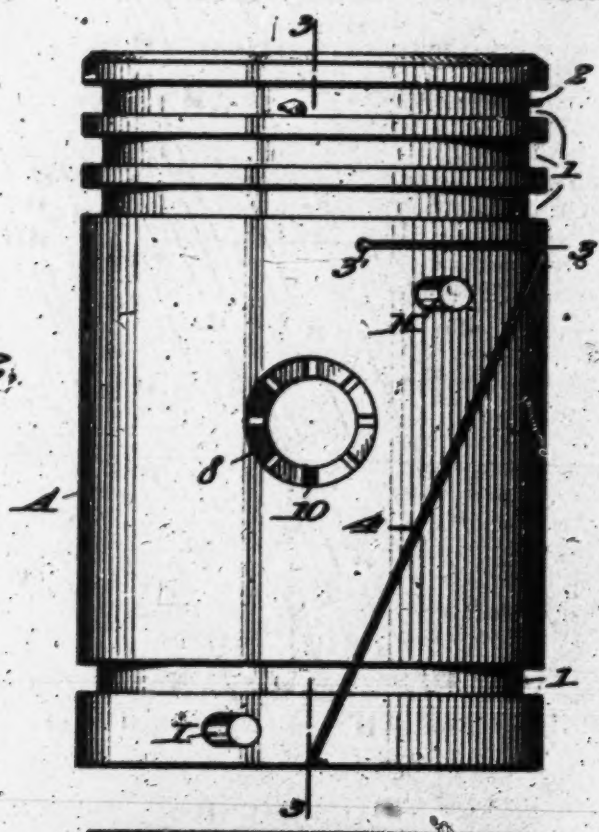
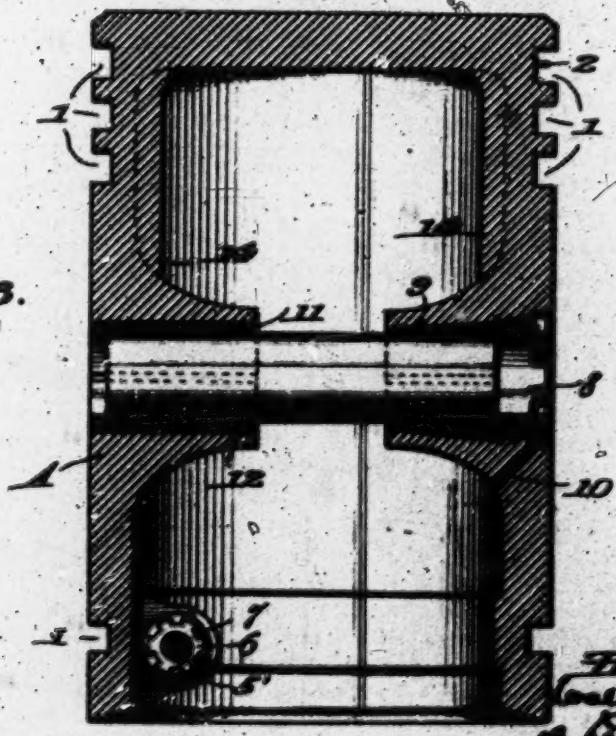


Fig. 3.



Inventor:
Wm. L. Schoengarth
By Louis Boyer
His Attys

UNITED STATES PATENT OFFICE.

WALTER L. SCHOENGARTH, OF IRONWOOD, MICHIGAN.

ADJUSTABLE GAS-ENGINE PISTON.

1,174,092. Specification of Letters Patent. Patented Mar. 7, 1916.

Application filed October 1, 1915. Serial No. 53,533.

To all whom it may concern:

Be it known that I, WALTER L. SCHOENGARTH, a citizen of the United States, residing at Ironwood, in the county of Gogebic and State of Michigan, have invented certain new and useful Improvements in Adjustable Gas-Engine Pistons, of which the following is a specification.

My invention relates to an adjustable gas engine piston, the object being to prevent what is called a piston knock and flutter, and in my present invention provision is made for adjusting the size of the piston according to rule, so that it can be made to last the lifetime of the motor. The result is, it is quiet, and without knock or flutter, thus rendering re-boring and new pistons unnecessary, prolonging the life and usefulness of the motor, and greatly reducing the cost of repair, etc.

My improved piston can be ground according to the ideas of the repairman or builder, doing away with all rough surfaces, after which it may be adjusted to a perfect fit in the cylinder-bore.

With these objects in view, my present invention comprises a piston which is transversely and diagonally slotted on one side, with means inside for expanding the piston to fit perfectly the bore of the cylinder.

It further consists in bushings for the cross-head pin, which are capable of quick and accurate adjustment to take up wear.

In the accompanying drawings: Figure 1 is a view of the motor in vertical section, showing the position of piston; Fig. 2 is a side elevation of the piston; Fig. 3 is a sectional view on the line 3—3 of Fig. 2; Fig. 4 is an end view looking into the piston; and Fig. 5 is a view of the wrench for adjusting nuts.

A, represents the piston, it being provided with the circumferential ring grooves 1, 1, adapted to receive packing-rings, and ring pins 2 are provided in these grooves to prevent the rings from shifting. The piston has two slots, namely a transverse slot 3 cut nearly half-way through on one side, and at each end of which a small hole 3' is drilled, and a diagonal slot 4 extending from the point near the center of the transverse slot 3 to one end of the piston. This slot is cut diagonally for two purposes, first, to prevent wear, and second, for convenience in making the upper and lower piston adjustment. The piston adjustment is taken up in two places, namely at the upper end of the diagonal slot and also at the lower end. The adjustment is through the two screws or studs 5 and 5' which turn in threaded orifices in the lugs C and D located at the upper and lower ends respectively of the piston, the inner ends of these screws or studs turning in the holes in the abutments E and F respectively. Access is gained to these screws by a screw-driver inserted through the holes H and I respectively, and jam-nuts 6 on these screws or studs have notched edges to receive the wrench 18 by which they are turned up tight by the lock-washers 7 against the lugs C and D. To expand the piston to the size required, the nuts are loosened, and the screws are turned in the lugs to get the required expansion, after which the jam-nuts are tightened up against the lugs, and in this way the piston may be re-fitted to the bore of the cylinder at any time without the necessity of re-boring or the purchase and substitution of new pistons. In fact this adjustment may be accomplished without removing the piston from the cylinder.

The ends of the cross-head pin 19 are supported in cross-head bushings 8, 9. These are preferably made of bronze or brass, and split longitudinally, having an external taper so that they are compressible around the ends of the cross-head pins by means of the take-up bushing nuts 8 at either end, and a cotter-pin 10 is inserted to hold the bushing nut 8 against turning. It is evident that a plain bushing, such as shown in 11, might be used instead of a tapering, adjustable one as described. The bushing-seats 14 are preferably reinforced at top of piston, as shown in Fig. 3. The piston is placed in the motor, as shown in Fig. 1, that is to say with the solid side of the piston toward the expansion wall or the side of cylinder where the explosion or combustion takes place and forces the piston against the cylinder wall on the power stroke, thus bringing the slots 3 and 4 on the right side of the engine.

Obviously more or less slight changes might be made in the form and arrangement of the several parts described without departing from the spirit and scope of my invention, and hence I do not wish to limit myself to the exact construction herein set forth, but—

I claim:

1. An expansible piston having a diag-

verse and longitudinal slot therethrough, and adjustable locking means located internally for expanding the piston.

2. A piston transversely and longitudinally slotted, and screws supported on one side of the longitudinal slot and engaging a member on the opposite side thereof, whereby when turned in one direction the piston is expanded, and when turned in the opposite direction it contracts by its own elasticity.

3. A piston transversely and longitudinally slotted, and screws supported on one side of the longitudinal slot and engaging a member on the opposite side thereof, whereby when turned in one direction the piston is expanded, and when turned in the opposite direction it contracts by its own elasticity, and means for locking said adjusting means.

4. A piston transversely and longitudinally slotted, and having holes therethrough on one side of the longitudinal slot, lugs and abutments located on opposite sides of the longitudinal slots and having orifices therein in alinement with the holes in the pistons, and screws extending through said orifices in the lugs and abutments, accessible through holes in the piston, for adjusting the piston.

5. A piston transversely and longitudinally slotted, and having holes therethrough on one side of the longitudinal slot, lugs and abutments located on opposite sides of the longitudinal slots and having orifices therein in alinement with the holes in the pistons, screws extending through said orifices in the lugs and abutments, accessible through holes in the piston, for adjusting the piston, and lock-nuts located on the screws on opposite sides of the lugs for locking the screw against turning to hold the piston in its adjusted position.

6. The combination with a piston, of a cross-head pin, a tapering adjustable bushing, and a take-up bushing-nut for moving the bushing endwise and contracting it around the cross-head pin.

7. The combination with a piston, of a cross-head pin, a tapering adjustable bushing, and a take-up bushing-nut for moving the bushing endwise and contracting it around the cross-head pin, the bushing-nut externally screw-threaded to turn in a threaded orifice concentric with the outer end of the bushing, and means for locking the bushing-nut against turning.

In testimony whereof I affix my signature.

WALTER L. SCHOENGARTH.

DEFENDANTS' EXHIBIT 4-H(7).

Prior Art Patent.

U. S. Patent No. 1,195,936, Aug. 22, 1916,

To C. White.

Piston and Piston Rod Connection.

(Filed January 27, 1934.)

C. WHITE.

PISTON AND PISTON ROD CONNECTION.

APPLICATION FILED AUG. 7, 1915. RENEWED JULY 20, 1916.

1,195,936. Patented Aug. 22, 1916.

Fig. 1.

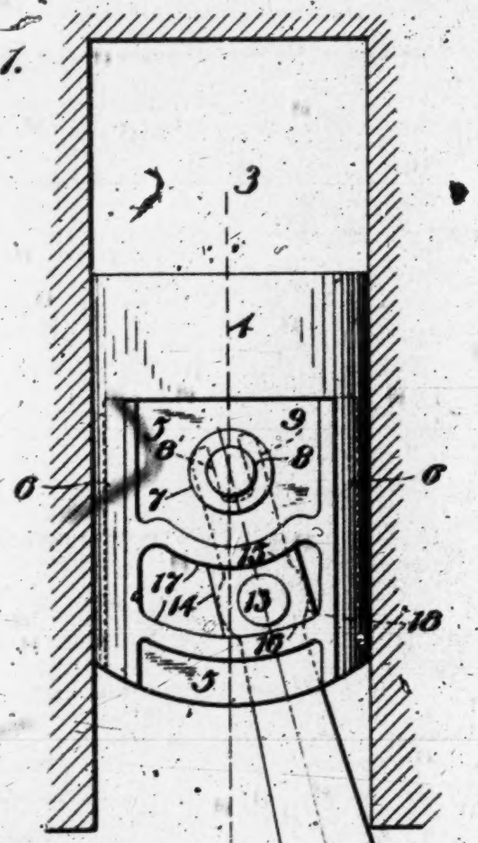
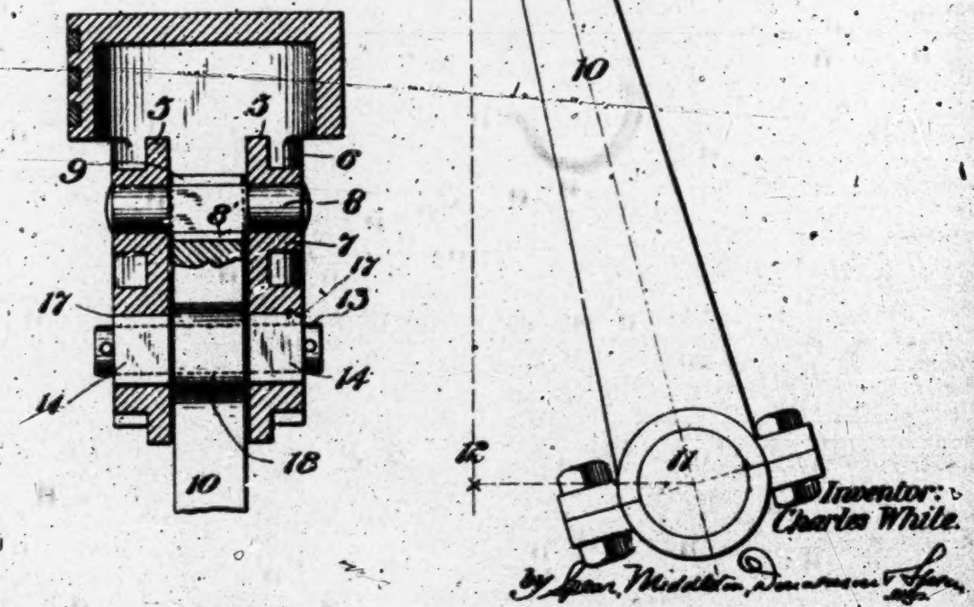


Fig. 2.



Inventor:
Charles White.

By Lyon, Middleton, Donnan & Lyon
Atys.

UNITED STATES PATENT OFFICE.

CHARLES WHITE, OF BALTIMORE, MARYLAND.

PISTON AND PISTON-ROD CONNECTION.

1,195,936. Specification of Letters Patent. Patented Aug. 22, 1916.

Application filed August 7, 1915, Serial No. 44,908. Renewed July 20, 1916. Serial No. 110,252.

To all whom it may concern:

Be it known that I, CHARLES WHITE, a citizen of the United States, residing at Baltimore, Maryland, have invented certain new and useful Improvements in Piston and Piston-Rod Connections, of which the following is a specification.

The invention consists in the features and combination and arrangement of parts hereinafter described and particularly pointed out in the claims.

In the drawings; Figure 1 is a diagrammatic view of a cylinder and piston with the connecting rod and crank. Fig. 2 is a longitudinal sectional view of the piston with the connecting rod in place partly in section.

In these drawings I show diagrammatically a cylinder 3 with its piston 4. This piston is formed with a cylindrical head portion and a reduced lower portion consisting of transverse walls 5 connecting the segments or sides 6 which conform in curve to the wall of the cylinder. In these transverse walls 5 bearings are provided for a pin 8, said bearings being indicated at 7. The pin 8 has cylindrical ends adapted to turn in these bearings and a central portion 8' with flat sides. This central portion is engaged by the slotted or forked upper end 9 of the connecting rod 10 which at its other end is connected with the crank pin 11, the center of the crank being indicated at 12 in line with the axis of the cylinder and piston. The driving connection or wrist pin connection between the piston and the connecting rod is provided by a pin 13 carried by blocks 14 having curved upper and lower surfaces 15 and 16 conforming to the curved walls of guide-ways 17 formed in the side walls 5. These guide-ways are concentric with the center of the pin 8.

The connecting rod 10 has an enlarged portion at 18 through which the wrist pin 13 extends. There is one of the guide blocks 14 for each end of the wrist pin 13, the connecting rod engaging the central portion of said wrist pin as shown in Fig. 2, which also illustrates the fact that the connecting rod works between the side walls or walls 5. The power from the piston is transmitted to the connecting rod through the wrist pin 13 and conversely the pull of the connecting rod, for instance on the suction stroke is transmitted to the piston through the said wrist pin 13, this being in contra-distinction to the usual practice in which the power is transmitted through a pin located in the plane of the axial center of the piston and immovably fixed in relation to said axial plane, as would be the case were the connecting rod 10 pivoted to the piston only by the pin 8.

It will be observed from Fig. 1 that with the crank on its quarter stroke the connecting rod extends at an angle to the axis of the piston and that the wrist pin lies to one side of said axis and on the same side thereof upon which the crank pin is now located. As the crank turns and the connecting rod approaches the axial plane of the piston the wrist pin 13 shifts in the guide 17 and approaches the axial plane until when the parts are on dead centers, the wrist pin 13 will be lying directly in the axial plane of the piston and as the crank continues to move and the crank-pin departs from the dead center and moves toward its other quarter stroke position the wrist pin will continue shifting, being thus carried across the dead center and occupying positions to one side of the axial center of the piston corresponding to the angular position of the crank pin. In these movements of the connecting rod its upper end will pivot about the pin 8, it being understood that the sole function of this pin is to control this pivotal movement and insure the shifting of the wrist pin from side to side of the axial center of the piston as the crank continues its rotation and it will be understood further that the pin 8 does not perform any function of transmitting the power between the piston and the connecting rod but that this function is performed entirely by the shifting wrist pin.

The shifting wrist pin takes the full strain exerted upon the piston and none of this strain is taken by the centrally arranged pin 8 which merely acts as a guide or controller for the wrist pin to insure its shifting properly within the prescribed limits.

I do not limit myself to the particular form or detail of the connection herein described. Where, for instance, I refer to a pin and slot or fork connection at 8, I mean by this that the pin 8 is so coupled to the end of the piston rod that the power will not be transmitted through this pin.

It will be noticed that the piston is provided, in effect, with two tracks or ways 17 concentric with each other, and that the block 14 constitutes a sliding connection be-

tween the piston and piston rod movable along said tracks or ways as the rod assumes different angular positions.

By my improvement I get long wearing surfaces between the shifting block and the curved guides of the piston.

I claim:—

1. In combination with a piston and cylinder, a crank pin and connecting rod and a shifting wrist pin forming the connection between said connecting rod and piston, said wrist pin shifting from one side to the other of the axial line of the piston in accordance with the movement of the crank pin to one side or the other of said axial line, substantially as described.

2. In combination with a piston and cylinder, a crank with its pin and connecting rod, said connecting rod being controlled by a pivot on the piston, guide means on the piston and a wrist pin to transmit the power between the piston and the connecting rod, said wrist pin being guided by said guide means and shifting from side to side of the center line of the piston as the connecting rod assumes different angular positions in relation to said center line, substantially as described.

3. In combination with a piston and cylinder, a crank pin and connecting rod, a slot and pin connection between the connecting rod and piston to control the pivotal movement of said connecting rod and a wrist pin connection between said piston and connecting rod with a guide-way carried by the piston for the said wrist pin, substantially as described.

4. In combination with a piston and cylinder, a crank and connecting rod, a shifting wrist pin connection between the connecting rod and piston, said wrist pin moving from side to side of the axis of the piston to accord with the movement of the crank pin and controlling means to control the pivotal movement of the connecting rod in relation to the piston, substantially as described.

5. In combination with a piston and cylinder, a connecting rod and crank, controlling means consisting of a pin and slot or forked connection between the end of the connecting rod and the piston and a wrist pin connection intermediate the said pin and slot connection and the crank and a guide on the piston concentric with the pivot pin, said guide receiving the wrist pin to permit the same to shift from side to side of the center of the piston, substantially as described.

6. In combination a piston, a connecting rod, means for controlling the pivotal movement of the connecting rod in relation to the piston, guide means on the piston concentric with said controlling means, a block or blocks movable in the guide way or ways, a wrist pin connected with the connecting rod and carried by the said block or blocks, substantially as described.

7. In combination with a piston and cylinder, a crank pin and connecting rod, and a shifting connection between said connecting rod and piston, said connection shifting from one side to the other of the axial line of the piston in accordance with the movement of the crank pin to one side or the other of said axial line.

8. In combination with a cylinder, a piston, piston rod and crank pin, said piston having two curved tracks or ways concentric with each other, and a sliding connection between the piston and piston rod movable along said tracks or ways as the piston rod assumes different angular positions in relation to the piston.

In testimony whereof, I affix my signature in presence of two witnesses.

CHARLES WHITE.

Witnesses:

RICHARD B. PUR,

EILEEN A. HEMSLEY.

DEFENDANTS' EXHIBIT 4-H(8).

Prior Art Patent.

U. S. Patent No. 1,229,540, June 12, 1917,

To E. O. Spillman.

Piston for Explosive Engines.

(Filed January 27, 1934.)

1704

E. O. SPILLMAN.

PISTON FOR EXPLOSIVE ENGINES.

APPLICATION FILED NOV. 11, 1916.

1,229,540.

Patented June 12, 1917.

Fig. 1.

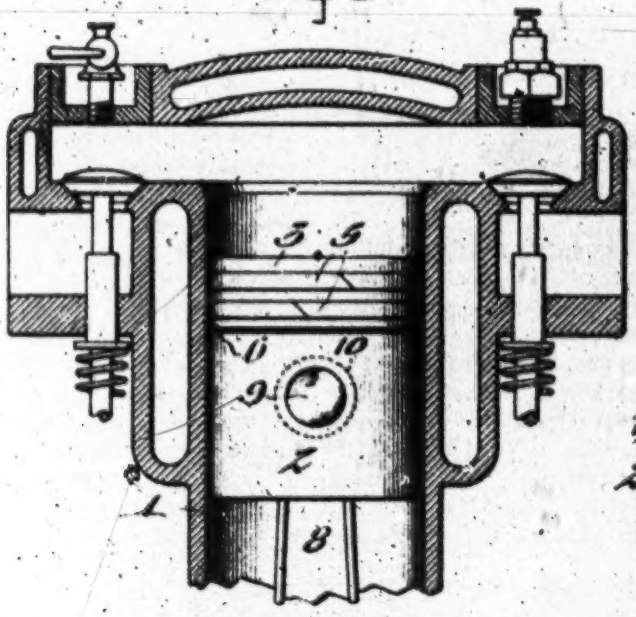


Fig. 2.

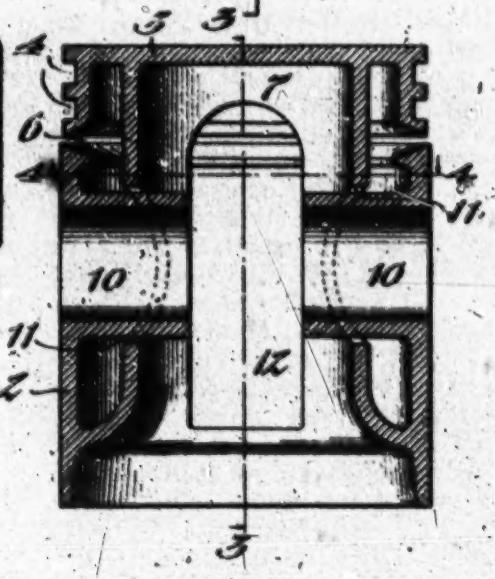


Fig. 3.

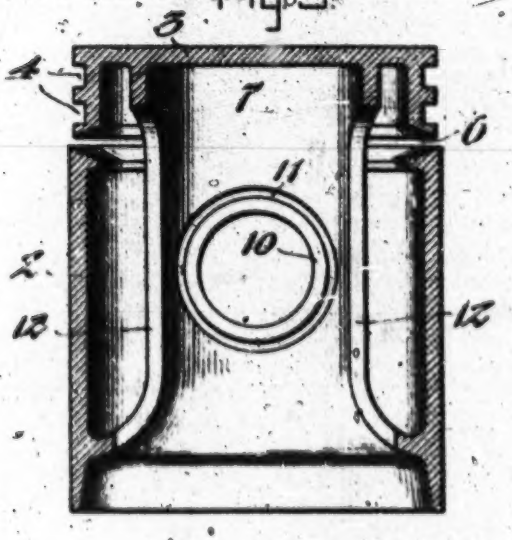
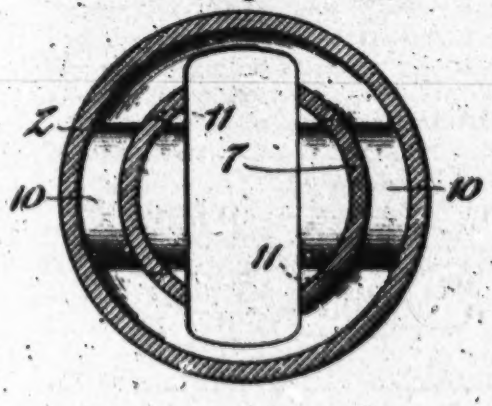


Fig 4.



INVENTOR

Edward O. Spillman

BY Geyer & Popp

ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDWARD O. SPILLMAN, OF NORTH TONAWANDA, NEW YORK.

PISTON FOR EXPLOSIVE-ENGINES.

1,229,540. Specification of Letters Patent. Patented June 12, 1917.

Application filed November 11, 1916. Serial No. 130,833.

To all whom it may concern:

Be it known that I, EDWARD O. SPILLMAN, a citizen of the United States, residing at North Tonawanda, in the county of Niagara and State of New York, have invented new and useful Improvements in Pistons for Explosive-Engines, of which the following is a specification.

This invention relates more particularly to the pistons of explosion engines or motors, and is in the nature of an improvement in the piston shown and described in Letters Patent of the United States No. 1,092,870, granted April 14, 1914, to Louis P. Mooers and myself.

The object of my invention is to so construct the piston that the conduction or transmission of heat from the head to the bearings of the wrist-pin is minimized to obviate binding or undue friction of the wrist-pin and obtain the maximum efficiency of the motor.

In the accompanying drawings: Figure 1 is a fragmentary sectional elevation of a motor equipped with my improved piston. Fig. 2 is an enlarged vertical longitudinal section of the piston taken through the axis of the wrist-pin bearings. Fig. 3 is a similar section on line 3—3, Fig. 2. Fig. 4 is a transverse section of the same on line 4—4, Fig. 2.

Similar characters of reference indicate corresponding parts throughout the several views.

1 indicates a motor-cylinder of any ordinary construction, the same forming no part of my invention.

2 indicates the body or guide portion of the improved piston, and 3 the head or top portion thereof which, as shown, is provided with the customary annular grooves 4 for receiving the packing rings 5.

As in the patent above referred to, the wall of the head is preferably isolated or separated from the wall of the guide portion of the piston by a gap or space 6 of suitable width to minimize the transmission of heat from said head section to said guide section and prevent binding of the latter in the cylinder, as more fully described in said patent. In the construction shown, the two sections of the divided piston are tied together by a tubular longitudinal web 7 arranged within the sections and cast in one piece therewith, but separated from the surrounding walls thereof by a comparatively wide space except at its lower end where it joins the wall of the guide-section 2.

8 indicates the usual connecting rod of the piston and 9 the wrist-pin carried by the same. This pin is journaled in suitable bearings 10, which are preferably integral with the guide section 2 of the piston, as clearly shown in Fig. 2. They extend inwardly from diametrically-opposite sides of the wall of the guide section and pass through openings 11, 11 arranged in the tubular web 7 and made of considerably larger diameter than the external diameter of the bearings to leave a non-conducting air-gap or space between the web and the bearings. This isolated construction of the bearings effectively prevents direct and excessive transmission of heat from the web to the bearings and the wrist-pin avoiding binding of the latter and reducing friction to a minimum. It is apparent that in order to reach the bearings, the heat from the hot piston-head 3 has to travel downwardly throughout the length of the web 7 to the point where it joins the lower portion of the guide section 2 and thence upwardly to the outer ends of the bearings. Owing to this long path of travel, the reduction of temperature at the bearings is sufficient to avoid undue or objectionable heating of them and the wrist pin, and inasmuch as the lower portion of the piston and the web are constantly cooled by the supply of oil in the crank case and from the cooled cylinder walls, the amount of heat transmitted from the piston-head to their bearings is practically reduced to a negligible degree, insuring a smooth and easy operation of the wrist pin as well as the piston.

To facilitate the circulation of the oil through the web, the latter may be provided in opposite sides with openings 12.

While affording the above advantage, the improvement does not increase the cost of the piston.

I claim as my invention:

1. A piston comprising a head-section, a guide-section forming a cross head, means connecting said sections and located at a distance from their walls, and a wrist-pin bearing supported on said cross head and isolated from said connecting means by a non-conducting gap.

2. A piston comprising a head-section, a guide-section forming a cross head and having its wall isolated from the wall of the

head-section by a non-conducting gap, a web arranged lengthwise within said sections and connecting the same, and a wrist-pin bearing supported on said cross head and isolated from said web by a non-conducting gap.

3. A piston comprising a head-section, a guide-section isolated from the head-section by a non-conducting gap, an internal web connecting said head-section with said guide-section, and wrist-pin bearings mounted on said guide-section, said web being provided in opposite sides with openings for the passage of said wrist-pin bearings which are larger in diameter than the bearings, to leave a non-conducting gap between said last-named parts.

4. A piston comprising a head-section, a guide-section isolated from the head-section by a non-conducting gap, a tubular web arranged lengthwise within said sections and connecting the same and provided within the guide-section with openings, and wrist-pin bearings mounted on said guide-section and extending inwardly through said openings, the bearings being isolated from the edges of said openings by non-conducting gaps.

EDWARD O. SPILLMAN.

DEFENDANTS' EXHIBIT 4-H(9).
Prior Art Patent.
U. S. Patent No. 1,279,184, Sept. 17, 1918,
To J. G. Vincent.
Piston.
(Filed January 27, 1934.)

1708

J. G. VINCENT.

PISTON.

APPLICATION FILED OCT. 22, 1913.

1,279,184.

Patented Sept. 17, 1918.

2 SHEETS—SHEET 1.

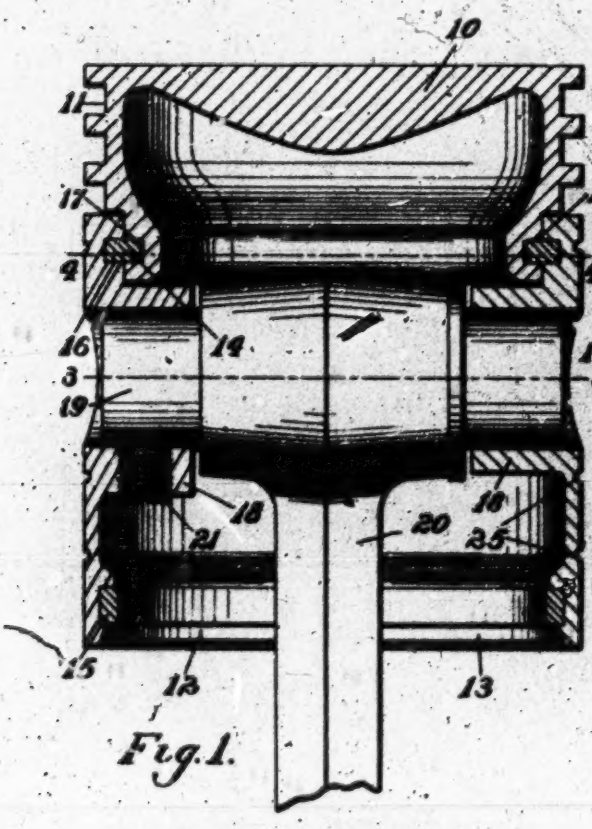


Fig. 1.

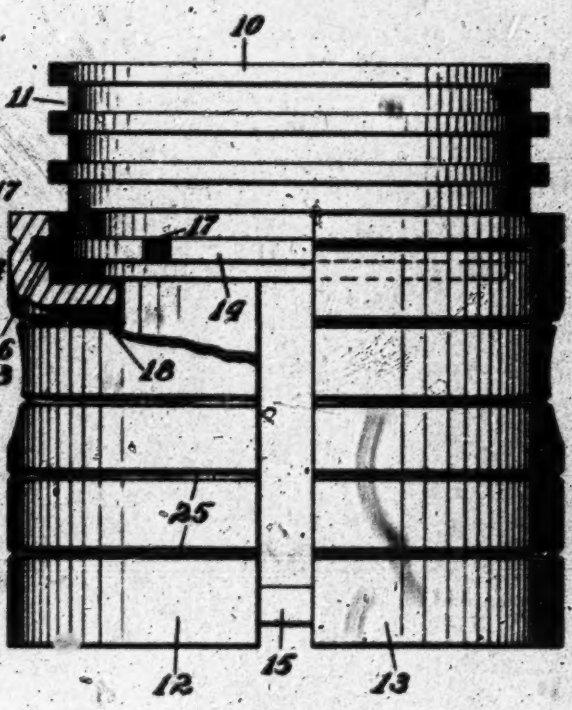


Fig. 2.

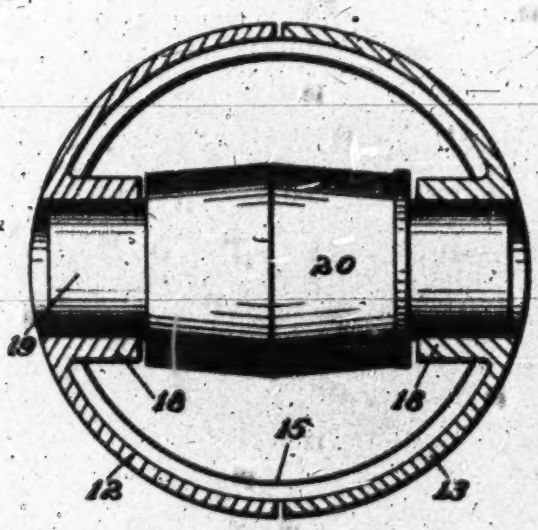


Fig. 3.

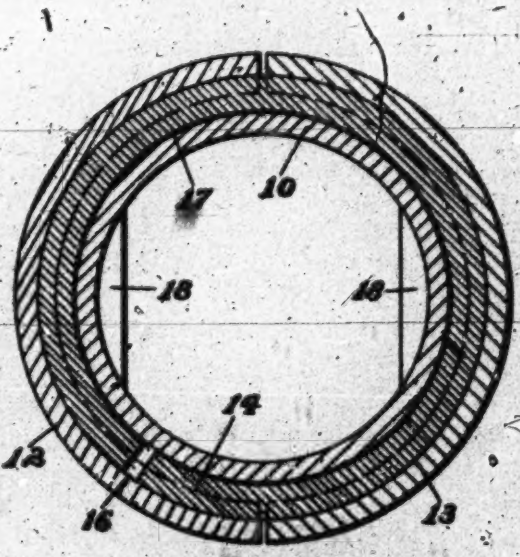


Fig. 4.

Witnesses:
Glen J. Cote,
Le Roy J. Williams.

Inventor
Jesse G. Vincent,
By Milton Tibbetts
Attorney.

1710

J. G. VINCENT.

PISTON.

APPLICATION FILED OCT. 22, 1913.

1,279,184.

Patented Sept. 17, 1918.

2 SHEETS—SHEET 2.

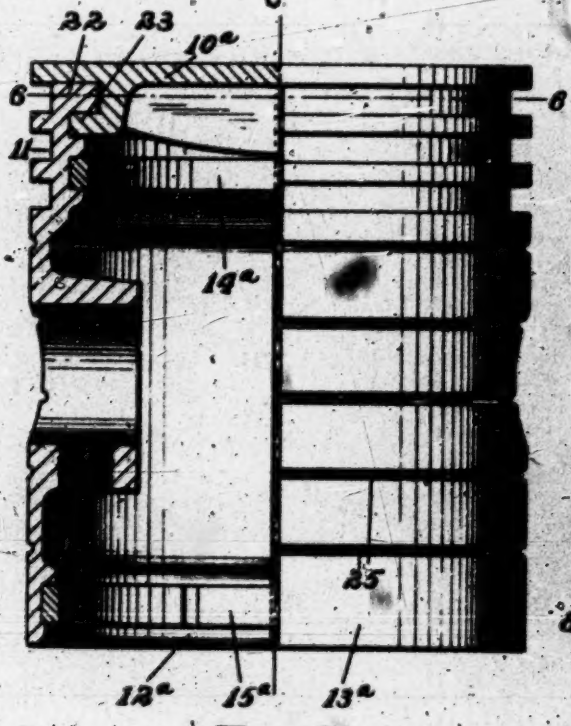


Fig. 5.

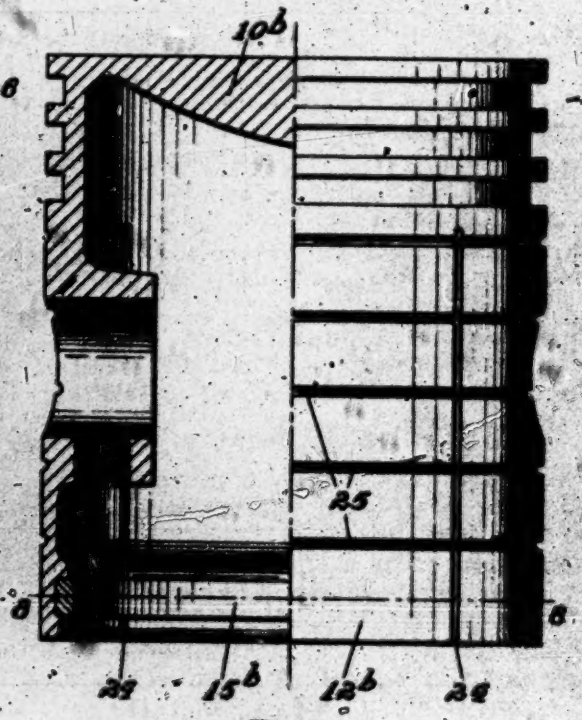


Fig. 7.

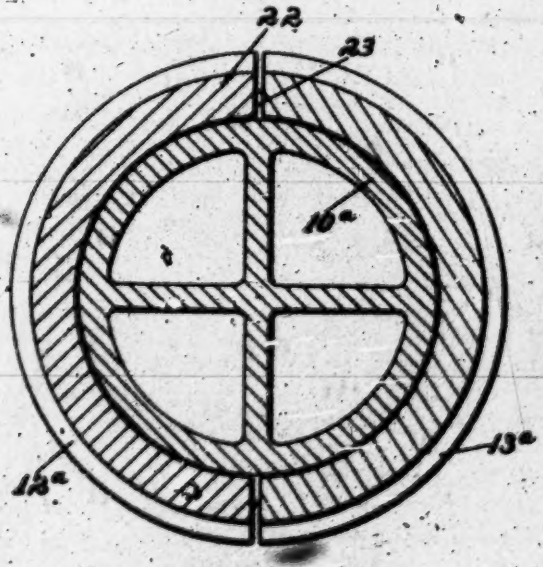


Fig. 6.

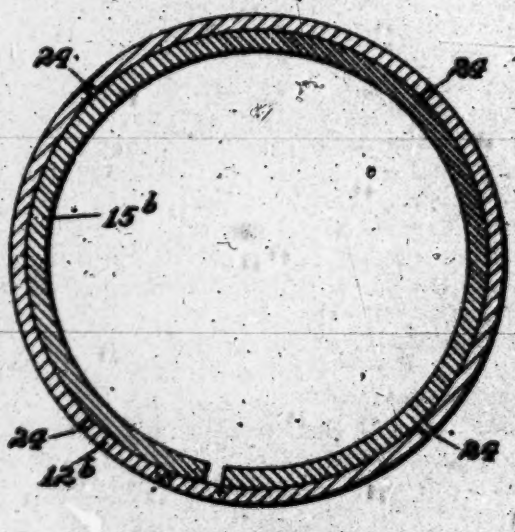


Fig. 8.

Witnesses:
Blair J. Cote,
H. Roi J. Williams.

Inventor:
Jesse G. Vincent,
By Miller & Sutton,
Attorney

UNITED STATES PATENT OFFICE. 1711

JESSE G. VINCENT, OF DETROIT, MICHIGAN, ASSIGNOR TO PACKARD MOTOR CAR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

PISTON.

1,279,184. Specification of Letters Patent. Patented Sept. 17, 1918.

Application filed October 23, 1913. Serial No. 796,647.

To all whom it may concern:

Be it known that I, JESSE G. VINCENT, a citizen of the United States, and resident of Detroit, Wayne county, State of Michigan, have invented certain new and useful Improvements in Pistons, of which the following is a specification.

This invention relates to pistons and particularly to pistons for hydrocarbon motors.

One of the essentials of a good hydrocarbon motor such as may be used for motor vehicles is that the fit between the piston and the cylinder wall shall be loose enough so that the piston will be free to operate when the motor is hot and yet shall be tight enough to minimize leakage and to prevent what is technically known as "piston slap," that is, the sudden movement of the piston from one side of the cylinder to the other, usually at or during the explosion stroke.

This desired fit is of course difficult to get, and because of the fact that the top of the piston is subject to greater heat than the bottom of it, the piston is often ground to a tapered form, that is, with a greater clearance at the top of the piston than at the bottom. Under these circumstances the heat will expand the upper part or head of the piston more rapidly than the lower part or skirt, and when the motor is hot the piston is substantially cylindrical in shape, thus making the clearance throughout the length of the piston about the same.

It will be seen, therefore, that it is desirable that the piston should be kept in fairly close contact with the wall of the cylinder throughout the length of the piston or so much of its length as is possible.

One of the objects of the present invention is to form a piston with a yieldingly expanded skirt portion.

Another object of the invention is to form a piston with a solid cylindrical head portion and a yieldingly expanded skirt portion.

Another object of the invention is to form a piston in which the skirt portion is capable of contracting under pressure.

Another object of the invention is to form a piston with a cylindrical head and with a skirt portion formed of a plurality of segmental parts.

Other objects of the invention will appear from the following description taken in connection with the drawings which form a part of this specification, and in which:—

Figure 1 is a longitudinal section through a piston made in accordance with this invention;

Fig. 2 is an elevation view of the piston shown in Fig. 1 with the parts separated somewhat and with some of them cut away;

Fig. 3 is a transverse section on the line 3—3 of Fig. 1 and;

Fig. 4 is a transverse section on the line 4—4 of Fig. 1;

Fig. 5 is a part elevation of another form of piston made in accordance with this invention;

Fig. 6 is a section on the line 6—6 of Fig. 5;

Fig. 7 is a view similar to Fig. 5 of another form of the invention; and

Fig. 8 is a section on the line 8—8 of Fig. 7.

Referring to the form of the invention shown in Figs. 1 to 4, the upper portion or head of the piston is indicated at 10 and it is shown as of cylindrical form and made in one piece. Suitable grooves 11 are cut in the circumferential part of this head portion to take the usual piston rings. The skirts of the piston are shown as in two semi-cylindrical parts 12 and 13 and these parts are adapted to be expanded against the cylinder wall by means of two expanding rings 14 and 15 at the upper and lower ends of the parts respectively, as shown in the drawings. The upper expanding ring 14 has a further function in that it joins the upper part of the piston to the lower or segmental parts. This is accomplished by fitting the ring 14 into two aligned annular grooves 16 and 17 in the skirt and head portions respectively of the piston.

The bosses 18 are shown as formed in the skirt portion of the piston for the reception of the piston pin 19 upon which is the connecting rod 20. A suitable screw 21 secures the piston pin in position.

In the form of the invention shown in Figs. 5 and 6, the head portion 10' of the piston is shorter and the two part skirt portion 12' and 13' is provided with the piston ring grooves 11 as shown in the drawings. In this form also the head and skirt portions of the piston are interlocked by means of annular flanges 22 and 23, the pi-

ton of course being assembled before it is placed in the cylinder. Expanding rings 14^a and 15^a are provided as in the previous form of the invention.

In the form shown in Figs. 7 and 8, the skirt portion of the piston is divided into four segments by means of sawing longitudinal grooves 24 therein. This leaves the skirt portion 12^b of the piston integral with the head portion 10^b and in the form of dependent segments, the lower parts of which segments may be expanded against the cylinder wall as by the expanding ring 15^b. In this form only one expanding ring is used, but two or more may be used as in the other form. The skirts of all of the pistons shown are provided with annular grooves 25 to facilitate lubrication of the piston.

It is understood that the invention is not limited to the exact details of construction shown in these various views, as it will be apparent that changes may be made and other forms employed without departing from the spirit or scope of the invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. A piston having a yieldingly expanding skirt portion and piston pin lugs formed wholly in said skirt portion.

2. A piston comprising a head portion and segmental parts forming the skirt portion, and means for yieldingly pressing said segmental parts radially outward, the piston pin lugs of the piston being formed wholly in said skirt portion.

3. A piston comprising an integral cylindrical head portion, a pair of semi-cylindrical parts forming the skirt portion, and separately formed annular means for connecting said portions.

4. A piston comprising an integral cylindrical head portion, a pair of semi-cylindrical parts forming the skirt portion, and separately formed circumferential interlocking connecting means for said portions.

5. A piston comprising an integral cylindrical head portion, a pair of semi-cylindrical parts forming the skirt portion, separately formed interlocking connecting means for said portions, and means for yieldingly expanding said semi-cylindrical parts.

6. A piston comprising a cylindrical head portion adapted to contact with a cylinder wall, a pair of semi-cylindrical parts forming the skirt portion, and an interlocking connecting ring for said portions.

7. A piston comprising a head portion, a separately formed skirt portion, and an interlocking connecting ring for said portions.

8. A piston comprising a head portion, segmental parts forming the skirt portion, and means acting to connect said portions and to press said segmental parts radially outward.

9. A piston comprising a head portion, segmental parts forming the skirt portion, and means acting to connect said portions and to yieldingly press said segmental parts radially outward.

In testimony whereof I affix my signature in the presence of two witnesses.

JESSE G. VINCENT.

Witnesses:
LE ROY J. WILLIAMS,
CLARE J. COTA.

DEFENDANTS' EXHIBIT 4-H(10).
Prior Art Patent.
U. S. Patent No. 1,283,021, Oct. 29, 1918,
To C. C. Anderson.
Light Weight Piston.
(Filed January 27, 1934.)

1714

C. C. ANDERSON.

LIGHT WEIGHT PISTON.

APPLICATION FILED OCT. 9, 1917.

1,283,021.

Patented Oct. 29, 1918.

Fig. 1.

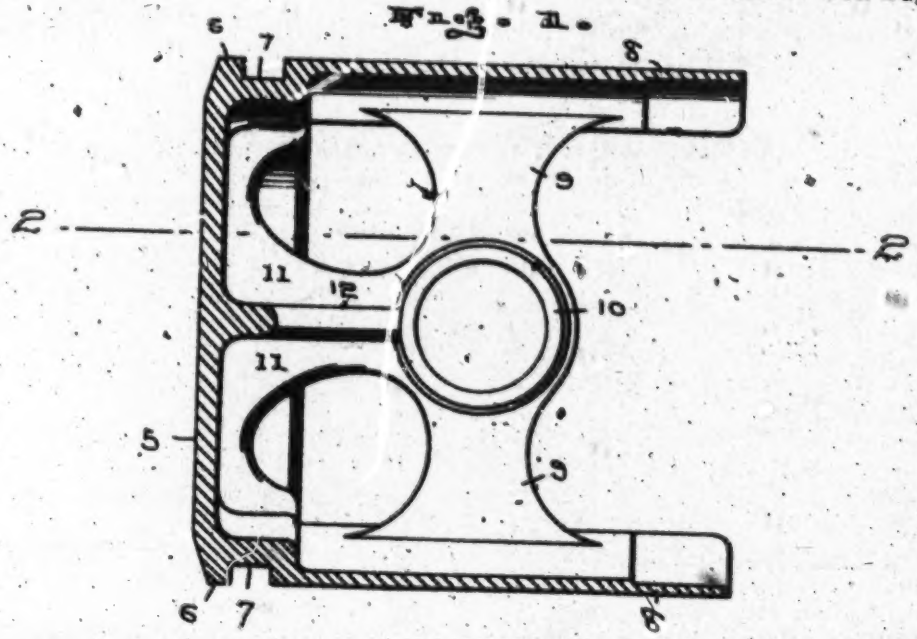


Fig. 2.

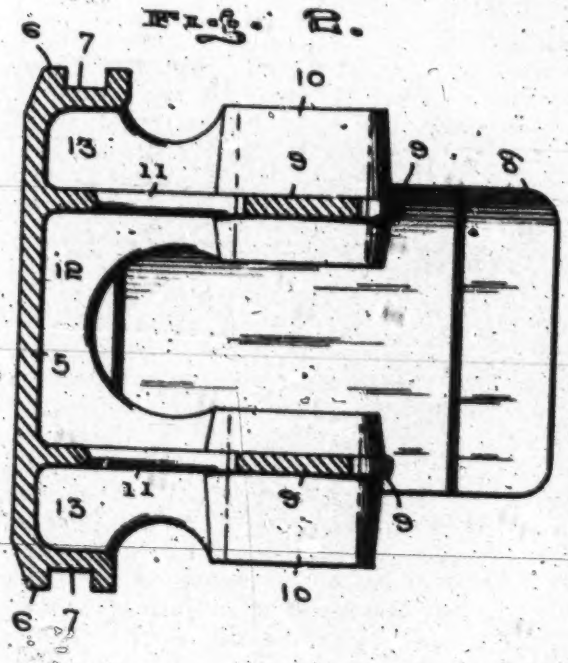
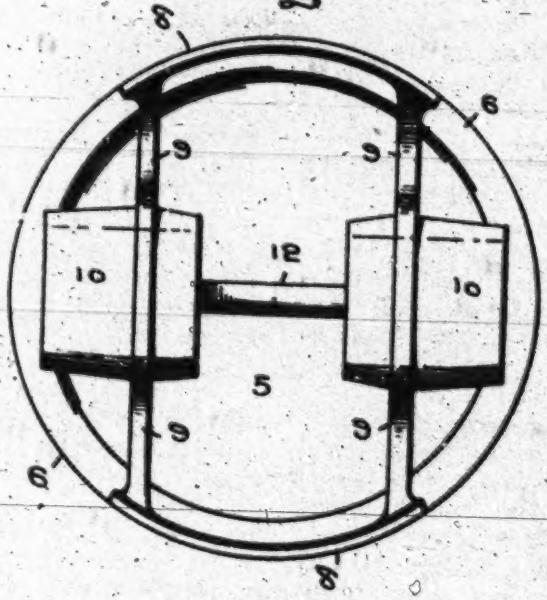


Fig. 3.



Inventor

C. C. Anderson

Fitzgerald & Co.

Attorneys

UNITED STATES PATENT OFFICE. 1715

CHARLES C. ANDERSON, OF CEDAR RAPIDS, IOWA.

LIGHT-WEIGHT PISTON.

1,283,021. Specification of Letters Patent. Patented Oct. 29, 1918.

Application filed October 9, 1917. Serial No. 195,889.

To all whom it may concern:

Be it known that I, CHARLES C. ANDERSON, a citizen of the United States, residing at Cedar Rapids, in the county of Linn and State of Iowa, have invented certain new and useful Improvements in Light-Weight Pistons; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention is in the nature of a light weight gray iron piston and cross head combined, for explosive engines and it has for its primary object to provide a combined device of the character described of improved design and make up, braced in every direction in the web, whereby, although much lighter than devices of similar character now in use, will withstand the heavy blows occasioned by the explosions in the cylinder.

The exceedingly great advantages which attend the use of light weight pistons have long been appreciated but all such light weight pistons of which I have knowledge are made of material other than gray iron of which I make my invention, being exclusively made of an aluminum mixture or alloy of some kind, or of steel or some other lighter material. None of these, so far as I have been able to learn, have given the service desired, and for the one great reason that the material is lacking in the properties which will withstand the extreme heat and at the same time does not possess durable qualities.

In developing this invention my efforts have been directed toward making an engine piston which will stand the heat and strains with the piston now in use, but with a greatly reduced weight. My present piston shows a reduction of 40% or 1¼ pounds which, in the lifting process going on continually in the operation where four pistons in a motor make 1800 revolutions per minute, results in the saving of 8100 pounds per minute.

The results of this are relieving the wear on the bearings in the crank-shaft; counteracting the vibratory effect on the motor, reducing the necessary amount of gas required, and at the same time bringing into the construction a material which has been tried out and found to be reliable beyond a doubt.

With the specified purposes in view, the invention consists in the improved material, and the combination, arrangement and construction of the parts hereinafter fully described and afterward specifically claimed.

In order that the construction and operation thereof may be readily comprehended, I have illustrated an approved embodiment of my invention in the accompanying drawing and will now proceed to fully describe the same with reference to said drawing, in which—

Figure 1 represents a sectional view of my invention on a plane cutting longitudinally and centrally through the device as illustrated in Fig. 2.

Fig. 2, a sectional view on the plane indicated by the dotted line 2—2 in Fig. 1, and

Fig. 3, an end view.

Like reference characters mark the same parts in all of the figures of the drawing.

Referring particularly to the drawing, 5 indicates the head of the piston from which extends, at its circumference, the skirt 6 and in order to shorten the skirt and assist in reducing the weight of the piston, I make it only wide enough to provide for one circumferential groove 7, and I prefer to use, as the only ring, a three-piece ring for which I have applied for Letters Patent.

From opposite sides of the skirt 6 extend bearing pieces or slides 8 curved on the same arc as the skirt but each extending only substantially one fifth of the circumference thereof, thereby further reducing the weight of the piston, and these slides are connected near their edges, by longitudinally flattened transverse webs 9, 9, which are formed with and support the sleeves 10, 10, which receive the pins of the cross-head, (not shown).

To further support the cross-head bearing sleeves, webs 11, 11, extending from the webs 9, 9, in the same plane therewith, connect the webs 9, 9, and the sleeves 10, 10, with the inner face of the head 1 of the piston and with the inside of the skirt, while an additional web 12, at right angles to webs 11, 11, connects these webs together and their inner faces with the sleeve 10, 10 and with the inner face of the head 5.

Other webs 13, 13, in the same plane as the web 12, but on the opposite sides of the webs 9, connect the outer sides of the webs 9, 9, and the sleeves 10, 10, with the inner face of the head 5 and the inner face of the skirt 6.

All of the webs are of skeleton form and

while they rigidly and strongly connect the head, the skirt, and the cross-head bearing sleeves, and are integral therewith, they are of very light weight and serve to very largely decrease the weight of the piston while giving it sufficient strength to resist all of the strains to which such pistons are subjected as well as pistons now in use and of very much greater weight.

As before stated, my piston is made of gray iron, in a single integral skeleton structure, and by virtue of its well known strength and lightness, as well as of the peculiar construction described, it will operate equally as well as the very much heavier pistons, while saving very largely in power required, and also equally as well as the light weight pistons of aluminum mixtures or alloys, which do not possess the durability of my piston, are entirely lacking in expansive qualities, and will not stand the heat in the cylinders.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A piston of gray iron consisting of a single, integral skeleton structure, comprising a head, a skirt of sufficient width to receive one ring only, bearing pieces for operating against the cylinder extending from opposite sides of the skirt, and sleeve bearings for the cross head pins supported from said bearing pieces.

2. A piston of gray iron consisting of a single, integral skeleton structure, comprising a head, a skirt of sufficient width to receive one ring only, bearing pieces for operating against the cylinder extending from opposite sides of the skirt, and sleeve bearings for the cross head pins supported from said bearing pieces, by means of skeleton webs extending from and connecting the opposite edges of the bearing pieces, the cross head sleeves being formed centrally of said webs and in line with each other.

3. A piston of gray iron consisting of a single, integral skeleton structure, comprising a head, a skirt of sufficient width to receive one ring only, bearing pieces for operating against the cylinder extending from opposite sides of the skirt, and sleeve bearings for the cross head pins supported from said bearing pieces, by means of skeleton webs extending from and connecting the opposite edges of the bearing pieces, the cross head sleeves being formed centrally of said webs and in line with each other, and additional supports for the sleeve bearings comprising a skeleton web at right angles to and connecting the first named webs with the sleeves and with the inner face of the head.

4. A piston of gray iron consisting of a single, integral skeleton structure, comprising a head, a skirt of sufficient width to receive one ring only, bearing pieces for operating against the cylinder extending from opposite sides of the skirt, and sleeve bearings for the cross head pins supported from said bearing pieces, by means of skeleton webs extending from and connecting the opposite edges of the bearing pieces, the cross head sleeves being formed centrally of said webs and in line with each other, and additional supports for the sleeve bearings comprising a skeleton web at right angles to and connecting the first named webs with the sleeves and with the inner face of the head, and two webs in the plane of the last named web connecting the outer faces of the first named webs with the sleeve and with the inner faces of the head and skirt.

5. A skeleton structure of gray iron forming a piston comprising a head, a skirt, slide bearings for the cylinder, extending from the skirt, sleeve bearings for the cross head pins, and webs connecting the cylinder slide bearings, the cross head bearing sleeves, the inner surface of the head and the inner surface of the skirt.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES C. ANDERSON.

Witnesses:
M. M. Holden,
Frank Hummert.

DEFENDANTS' EXHIBIT 4-H(11).

Prior Art Patent.

U. S. Patent No. 1,294,833, Feb. 18, 1919.

To H. R. Ricardo.

Piston for Internal Combustion Engines.

(Filed January 27, 1934.)

1718

H. R. RICARDO.

PISTON FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 23, 1918.

1,294,833.

Patented Feb. 18, 1919.

FIG. 1.

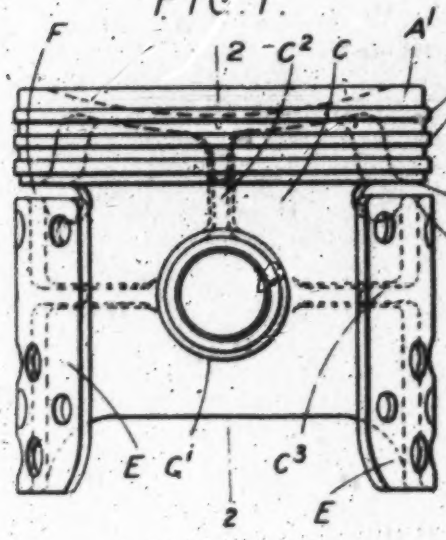


FIG. 2.

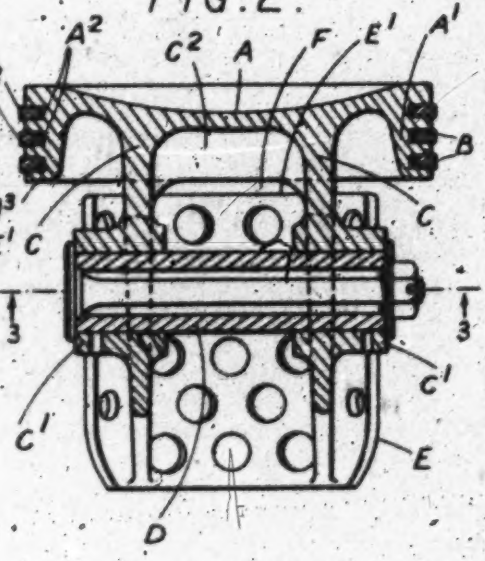
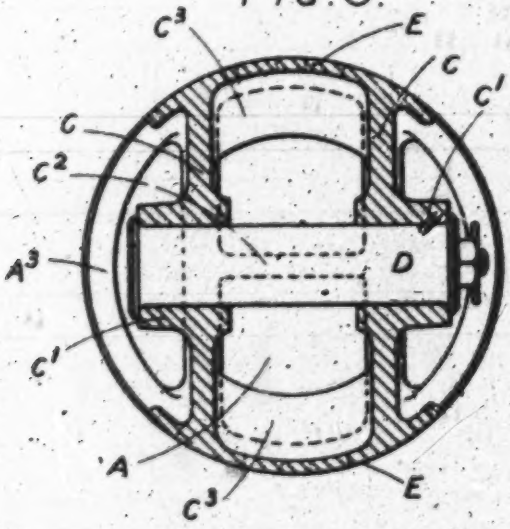


FIG. 3.



Inventor.
Harry R. Ricardo,
By Foster, Freeman, Watson & Coit,
Attorneys.

UNITED STATES PATENT OFFICE.

HARRY RALPH RICARDO, OF LONDON, ENGLAND.

PISTON FOR INTERNAL-COMBUSTION ENGINES.

1,294,833. Specification of Letters Patent. Patented Feb. 18, 1919.

Application filed April 22, 1918. Serial No. 229,555.

To all whom it may concern:

Be it known that I, HARRY RALPH RICARDO, a subject of the King of England, residing at London, in England, have invented certain new and useful Improvements in Pistons for Internal-Combustion Engines, of which the following is a specification.

This invention relates to pistons for internal combustion engines and has for its object to effect certain improvements in a known type of piston in which the piston head performs solely piston functions while the guiding is performed by members disposed on either side of the gudgeon pin, these guide members being extensions from the piston head flange.

In the design of piston for internal combustion engines, more especially pistons which are constructed of aluminium or aluminium alloy one of the difficulties which arises is due to the large clearance that must be allowed between the piston and the cylinder walls in order to permit of expansion. In an aluminium piston of normal design if sufficient provision is made to allow for expansion when the piston attains its highest temperature the clearance when the parts are cold is then so great that considerable noise is caused as the annular thrust of the connecting rod is reversed on passing the dead centers and consequently the piston is thrust from one side of the cylinder to the other, causing noise. By means of the present improvements this noise is reduced, as the piston is so designed that a large working clearance is not required.

According to this invention the piston comprises a flanged head of such diameter that it is a loose fit within the cylinder, with the wall of which it does not come in contact, the flange being provided with grooves in which are piston rings, and a guide portion which is a sliding fit in the cylinder and comprises two curved members or slippers between which lies the gudgeon pin. This guide portion is adapted to take the whole of the side thrust from the connecting rod and each of the curved members is separated by a continuous gap from the adjacent edge of the piston head flange. Webs carry the gudgeon pin and constitute the only connection between the curved guide members and the face of the piston head disk, with all of which parts the webs are integral. The arrangement of the webs is such that heat will be so conveyed from the piston head to the slippers as to be distributed equally over the whole surfaces of the slippers. The webs comprise two main members which may or may not be arranged parallel and are integral with and spring from the face of the piston head disk, each main portion of these webs being formed with a boss adapted to carry the gudgeon pin. The two curved guide members or slippers are oppositely disposed so as to inclose the gudgeon pin bosses, these slippers being as mentioned connected to and formed integral with the webs and through the latter connected to the piston head and gudgeon pin bosses.

The accompanying drawings illustrate by way of example one construction of piston in accordance with the present invention. In these drawings,

Figure 1 is a side elevation of the improved piston.

Fig. 2 is a sectional elevation on the line 2—2 of Fig. 1.

Fig. 3 is a transverse section on the line 3—3 of Fig. 2 looking in the direction of the arrows.

Like letters indicate like parts throughout the drawings.

The head of the piston comprises a disk portion A which is conveniently dished as shown in Fig. 2, and a flange A', the diameter of which is such in relation to the internal diameter of the cylinder that a large clearance is provided and the piston head will not come at all in contact with the cylinder walls. In the flange A' are grooves A^2 in which are carried piston rings B. Two main webs C spring from the piston head A across which they extend and with which they are formed integral. These webs C are parallel to each other in the construction shown in the drawings and project to a convenient distance from the head of the piston head. In each web C is formed a boss C' adapted to carry the gudgeon pin D which may be of suitable construction and either adapted to float in the bosses C' or be fixed therein as found desirable. On either side of the gudgeon pin bosses C' the webs C extend laterally and unite with two curved guide or slipper members E which are integral with the webs so that the latter constitute the connection between the slipper members and the piston head A. It is desirable to provide also a small central

transverse web C^2 which springs from the face of the piston head A and lies between and conflects with the parallel webs C. Small supplementary webs C^3 are also conveniently provided across the inner side of the guide slippers E and between the webs C with each of which parts these supplementary webs C^3 are integral.

As will be clearly seen in Figs. 1 and 2, the upper edge E' of each curved guide member E is separated by an unbroken continuous gap F from the adjacent opposed edge A^2 of the piston head flange A'. Thus while the guide members E are rigidly connected to the piston head A they are not in contact with the piston head flange.

Holes are preferably made through the slippers E as shown in Figs. 1 and 2.

The two webs C serve to distribute both the pressure and the heat delivered to the crown of the piston. The whole of the thrust and such heat as thus passes through the webs C are transmitted to the guide members E and distributed equally over them owing to the manner in which the guide members are joined to the webs C. By reason of the guide members E being separated at their edges from the piston head, heat can only pass from the latter to the guide members through the webs C and then only in such a manner as to effect satisfactory and equal distribution of the heat over the guide surfaces. Moreover the total amount of heat delivered to the bearing surfaces of the guide members is reduced and these surfaces can be freely lubricated. As a result of the reduced heat flow to the crosshead portion of the piston, which is composed of the guide members E and more especially as a result of the even distribution of heat over all the guide surfaces it becomes possible to provide a less clearance for expansion. In the case of a normal construction of piston the heat is transmitted from the piston head along the trunk and consequently the heat which flows through the upper part of the trunk immediately beyond the piston rings is excessive while toward the lower or outer end of the trunk the heat is relatively slight.

Though the present invention is more especially intended to be employed in the construction of a piston formed of aluminium or aluminium alloy, it is to be understood that it is equally applicable to a piston formed of cast iron, the details of construction being modified or not as found necessary.

The shape and dimensions of the slipper members may be varied as also the other details of the construction such as the width of the gap between the slipper members and the piston head flange and the shape and disposition of the webs. Thus for example the bearing surface of one slipper member may have a greater area than the bearing surface of the other slipper member, the two slipper members then being conveniently of different widths when measured in the circumferential direction. In such a construction instead of the webs C being parallel to each other these webs may be inclined and extend between the lateral edges of one slipper member and the corresponding lateral edges of the other slipper member.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having an integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap extending in the circumferential direction, two webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

2. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved relatively long members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction, two webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

3. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having an integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being

rated from the head flange by a continuous gap extending in the circumferential direction and the diameter of the guide thus formed by these two curved members being slightly greater than the diameter of the piston head, two webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

4. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved relatively long members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction and the diameter of the guide thus formed by these two curved members being slightly greater than the diameter of the piston head, two webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

5. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having an integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap extending in the circumferential direction, two webs which are integral with and spring from the head disk and are connected to and integral with the lateral portions of the guide members and constitute the only connection between the face of the head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

6. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved relatively long members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction, two webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head and the guide members, gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members, and a web formed integral with the piston head disk and extending transversely across this disk between the two main webs as set forth.

7. In a position for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having an integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap extending in the circumferential direction, two parallel webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

8. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved relatively long members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction and the diameter of the guide thus formed by these two curved members being slightly greater than the diameter of the piston head, two webs which are integral with and spring from the head disk and are connected to and integral with the lateral portions of the guide members and constitute the only connection between the face of the head disk and the guide members, gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members, and a web formed integral with the piston head disk and extending transversely

across this disk between the two main webs as set forth.

9. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved and similar relatively long members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction and the diameter of the guide thus formed by these two curved members being slightly greater than the diameter of the piston head, two parallel webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members, and a web formed integral with the piston head disk and extending transversely across this disk between the two main webs as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HARRY RALPH RICARDO.

Witnesses:
A. J. Hall,
R. Baggott.

DEFENDANTS' EXHIBIT 4-H(12).
Prior Art Patent.
U. S. Patent No. 1,325,176, Dec. 16, 1919,
To A. Spillman.
Engine Piston.
(Filed January 27, 1934.)

1724

A. SPILLMAN.

ENGINE PISTON.

APPLICATION FILED FEB. 12, 1919.

1,325,176. Patented Dec. 16, 1919.

Fig. 1.

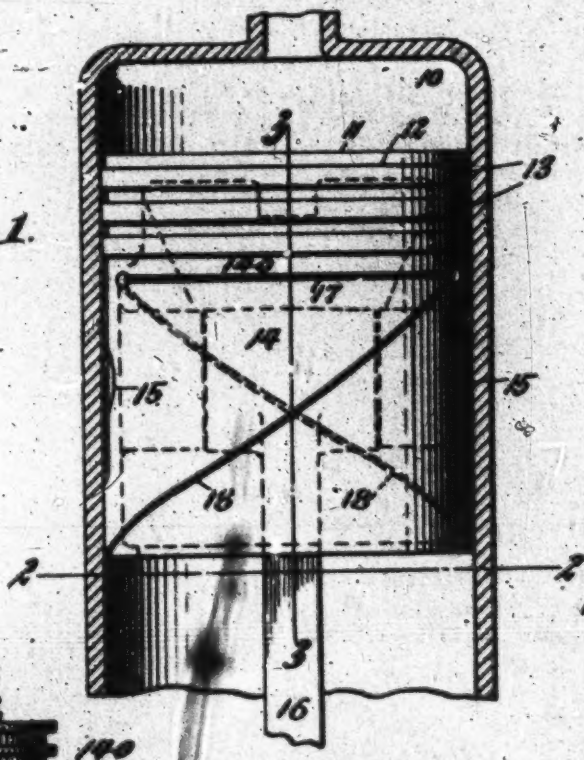


Fig. 3.

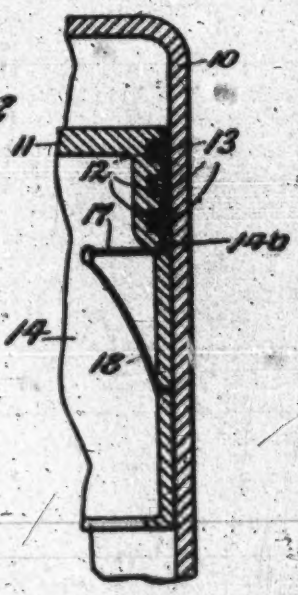


Fig. 4.

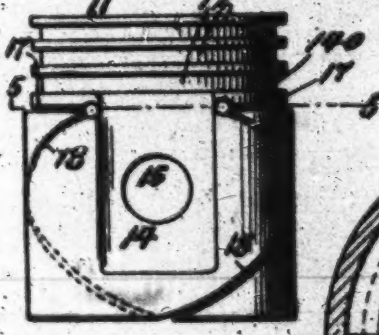


Fig. 2.

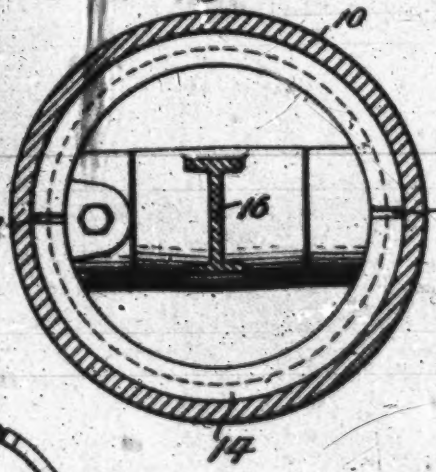


Fig. 5.

Inventor
Albert Spillman
by Lyon & Lyon
Attorneys

UNITED STATES PATENT OFFICE. 1725

ALBERT SPILLMAN, OF NORTH TONAWANDA, NEW YORK.

ENGINE-PISTON.

1,325,176. Specification of Letters Patent. Patented Dec. 16, 1919.

Application filed February 13, 1919. Serial No. 276,466.

To all whom it may concern:

Be it known that I, ALBERT SPILLMAN, a citizen of the United States, residing at North Tonawanda, in the county of Niagara and State of New York, have invented new and useful Improvements in Engine-Pistons, of which the following is a specification.

This invention relates generally to engine-pistons, but more particularly to the type of pistons used in internal combustion engines or motors and having a skirt or tubular portion extending rearwardly from the piston-head.

The object of my invention is the production of an inexpensive self-adjusting and non-rattling piston of this kind which may be snugly fitted in the cylinder without danger of scoring it, and which bears uniformly against the cylinder wall around the entire circumference of the piston skirt and practically throughout its length.

In the accompanying drawings:

Figure 1 is a fragmentary longitudinal section of an internal combustion engine containing the improved piston. Fig. 2 is a transverse section on line 2—2, Fig. 1. Fig. 3 is a fragmentary longitudinal section on line 3—3, Fig. 1. Fig. 4 is a reduced side elevation of the piston, at right angles to Fig. 1. Fig. 5 is a horizontal section on line 5—5, Fig. 4.

Similar characters of reference indicate corresponding parts throughout the several views.

10 indicates the engine cylinder which may be of any approved construction, and 11 indicates the solid piston head having the customary annular grooves 12 for receiving the packing rings 13.

Extending rearwardly from the piston head is the skirt or tubular body 14 which contains the customary holes or bearings 15 for the piston pin to which the rod 16 is connected. In order to give the skirt the necessary resilience or contractile capacity to prevent scoring of the cylinder, it is provided at opposite sides with transverse or substantially horizontal slits 17 located near the upper end of the skirt, and spiral or diagonal slits 18 extending from one end of the horizontal slits to the rear edge of the skirt, the spiral slits trending in opposite directions, as best shown in Fig. 1. As seen in Fig. 4, the lower or rear ends of the spiral slits preferably terminate at points in line with the centers of the respective piston-pin holes, or substantially so, while the horizontal slits are formed principally in those sides of the skirt at right angles to the sides which contain the holes 15. These horizontal and spiral slits divide the skirt into a number of resilient tongues or sections of approximately triangular form which taper in opposite directions on the same side of the skirt, the small or pointed end of each tongue lying beside the wide end of the adjacent tongue, as shown in Fig. 1.

The grooved head of the piston is slightly smaller in diameter than the skirt, as usual, and to obtain the best results the narrow portion 140 of the skirt above its horizontal slits 17 is preferably reduced to the same diameter as said grooved head. In the drawings, this difference in diameter is exaggerated; in practice it usually does not exceed eight-thousandths of an inch in a three-inch piston.

By this construction, the skirt is rendered resilient around its entire circumference and practically throughout its length. It may therefore be snugly fitted in the cylinder without liability of scoring it, thus obtaining the maximum efficiency of the motor. With this improvement, even after the skirt of a three-inch piston wears about four-thousandths of an inch, it will still fit the cylinder closely enough to avoid knocking or rattling.

The engine will also continue in reliable operation for a comparatively long time, inasmuch as little or no oil can work past the piston into the top of the cylinder, thereby preventing burning of the oil by the spark and the formation of carbon and avoiding the coating of the spark-plugs and the production of a smoking exhaust.

If the slitted portion of the skirt be made, say two thousandths of an inch larger in diameter than the cylinder bore, it will act practically as a wide piston-ring or packing, the sections resulting from the slitting of the skirt being wholly disconnected from each other and unrestrained both in their expanding and contracting movements. The skirt is therefore self-adjusting and free to compensate for variations of diameter due to wear or changes of temperature of the piston and the cylinder, thus maintaining a close, non-rattling fit of the piston in the cylinder without causing sticking of the piston or scoring of the cylinder.

This construction and the resulting ad-

vantages render the use of aluminum practicable for such pistons, thus securing the additional advantage of lightness.

In the manufacture of the piston, after it has been slitted, the pointed ends of its resilient tongues or sections tend to spring out beyond the true cylindrical line of the piston. To avoid this, they are held in proper position by spot-welding or other suitable means and the surface of the piston is then ground to a true cylinder. The spot-welds are then removed, or if desired, they may be left in place until the piston is shipped to destination, when they are removed by the user.

I claim as my invention:

1. An engine piston having a head and a resilient automatically-expansible skirt extending rearwardly from the head, said skirt being tubular and provided at opposite sides near said head with transverse slits, and spiral slits extending from said transverse slits to the rear edge of the skirt, the two oppositely-tapering sections formed by said slits on the same side of the skirt being completely disconnected from each other and capable of springing inwardly and outwardly without restraint except by the inclosing cylinder-wall when the piston is in the cylinder.

2. An engine piston having a head and a resilient automatically-expansible skirt extending rearwardly from the head, said skirt being tubular and provided at opposite sides near said head with transverse slits, and spiral slits each extending from one end of the companion transverse slit to the rear edge of the skirt, the two oppositely-tapering sections formed by said slits on the same side of the skirt being completely disconnected from each other and unrestrained in their contracting and expanding movements, except by the inclosing cylinder-wall, when the piston is in the cylinder.

3. An engine piston having a head and a resilient automatically-expansible skirt extending rearwardly from the head, said skirt being tubular and having piston-pin holes at opposite sides, transverse slits formed in the sides of the skirt substantially at right angles to those containing said holes, and spiral slits each extending from a point in the rear edge of the skirt substantially in line with one of said holes, to the farther end of one of said transverse slits, the pair of oppositely-tapering sections formed by said slits on the same side of the piston being wholly disconnected from each other and the front section of the pair being likewise disconnected from said head throughout the length of the corresponding transverse slit, said several sections being free to spring inwardly and outwardly without restraint except by the inclosing cylinder-wall when the piston is in the cylinder.

4. An engine piston having a head and a resilient tubular skirt provided at opposite sides with piston-pin holes, each of the two remaining sides of the skirt comprising resilient automatically-expansible tongues arranged circumferentially of the skirt and extending from a point near said head to the rear edge of the skirt, adjacent tongues extending in opposite directions from their fixed ends toward their free ends and being disconnected from each other and unrestrained in their contracting and expanding movements, except by the inclosing cylinder-wall when the piston is in the cylinder.

5. An engine piston having a head and a tubular skirt extending rearwardly therefrom, said skirt comprising automatically-expansible spring-tongues extending in a circumferential series around the skirt, said tongues being integral with said head, adjacent tongues extending in opposite directions from their fixed ends toward their free ends, and the several tongues being disconnected from each other at their adjacent sides from a point near said head to the rear edge of the skirt and unrestrained in their contracting and expanding movements except by the inclosing cylinder-wall when the piston is in the cylinder.

ALBERT SPILLMAN.

DEFENDANTS' EXHIBIT 4-H(13).

Prior Art Patent.

U. S. Patent No. 1,395,441, Nov. 1, 1921,

To E. C. Long.

Piston.

(Filed January 27, 1934.)

1728

E. C. LONG.

PISTON.

APPLICATION FILED DEC. 9, 1918.

1,395,441. Patented Nov. 1, 1921.

Fig. 1.

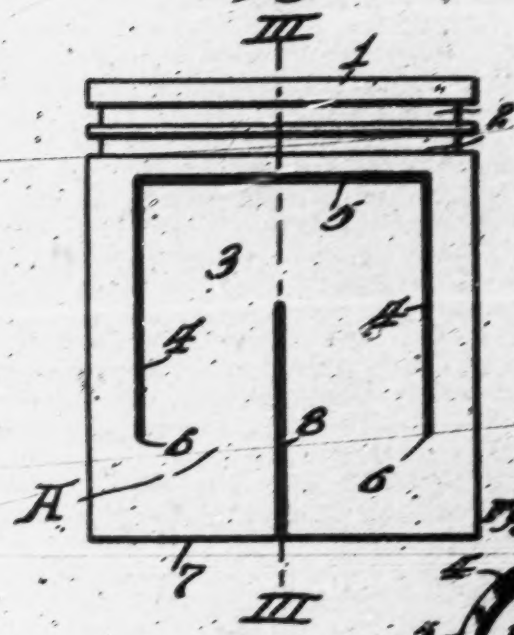


Fig. 2.

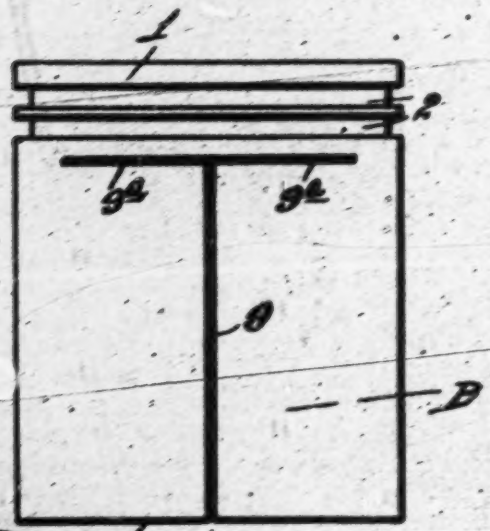


Fig. 3.

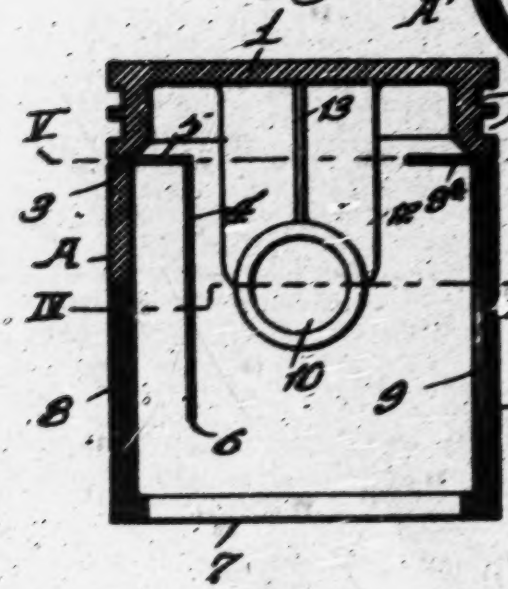
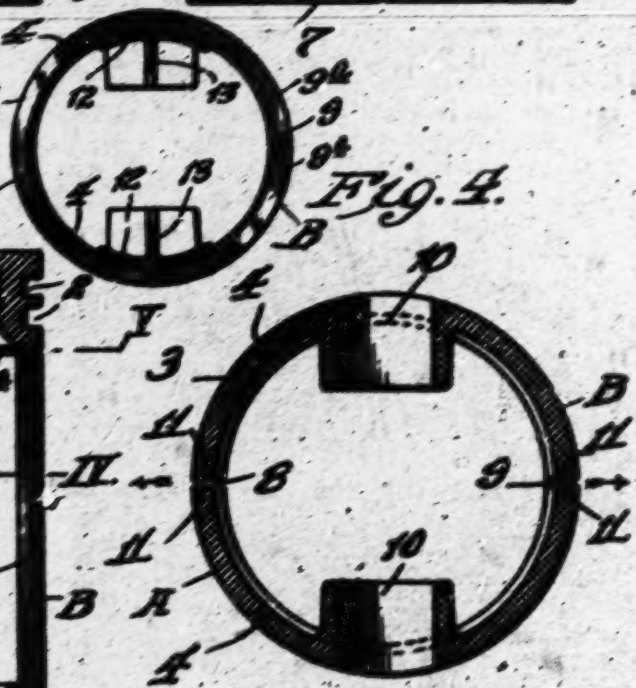


Fig. 4.



Inventor:
Elmer C. Long.
By L. G. Hatcher
atty.

UNITED STATES PATENT OFFICE.

ELMER C. LONG, OF QUINCY, ILLINOIS.

PISTON.

1,395,441. Specification of Letters Patent. Patented Nov. 1, 1921.

Application filed December 9, 1918. Serial No. 265,947.

To all whom it may concern:

Be it known that I, ELMER C. LONG, a citizen of the United States of America, and a resident of Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Pistons, of which the following is a specification.

This invention relates to improvements in pistons.

One of the objects of this invention is to provide an improvement in a piston which is more especially used in internal combustion motors in which means are provided in the piston whereby a better fitting relation is provided thereto relative to the cylinder in which the piston is adapted to reciprocate.

Another object of the invention is to provide an improved piston in which the lower and intermediate portions thereof are capable of expanding and contracting more readily than heretofore relative to the heat contained in the cylinder.

A further object of the invention is to provide an improved piston in which the back-slap or connecting rod thrust will be eliminated.

Other and further objects will appear in the specification and be specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which,

Figure 1 is a side elevation of this improved piston.

Fig. 2 is a side elevation opposite to that shown in Fig. 1.

Fig. 3 is a vertical section taken on the line III—III of Fig. 1.

Fig. 4 is a horizontal section taken on the line IV—IV of Fig. 2.

Fig. 5 is a horizontal section on a reduced scale taken on the line V—V of Fig. 2.

Referring to the drawings the solid end 1 of the piston has the usual piston ring grooves 2 formed therein. In order to more fully describe this improved invention that portion of the piston shown in Fig. 1 will be hereinafter designated the A-side portion, whereas that portion in Fig. 2 will be hereinafter designated as the B-side portion.

Formed in the side portion A is a cut-out tongue shaped portion 3, said tongue portion being formed by a pair of vertically cut slots 4 and a horizontally cut slot 5 adjoining the upper ends of said slots 4, the lower ends of the slots 4 terminating as shown at 6 a distance above the lower end 7 of the piston. Leading from the lower end of the piston in the side portion A is a vertically formed slot 8 which extends upwardly intermediate of the tongue portion 3 and terminates at a point about midway of the length of said tongue portion.

Centrally arranged in the side portion B of the piston is a vertically formed slot 9 which extends from the lower end of the piston 7 and terminates a short distance below the lower piston ring recesses 2, and there being a pair of horizontally formed slots 9ª leading from the vertically formed slot 9, said slots 9 and 9ª forming a T-shape. This slot 9 is diametrically opposite from the slot 8. The slots 8 and 9 are also arranged at right angles to the wrist pin openings 10.

Heretofore in the manufacture and use of pistons for internal combustion motors, due to their having a solid peripheral cylinder bearing surface, the diameters of said pistons have to be turned off to diameters that are much less than the diameters of the cylinders in which they are to reciprocate, on account of the fact that extreme expansion of the piston has to be taken care of in order to prevent too much friction which is caused by too tight a fit of the piston in the cylinder. With this improved piston in which the tongue portion 3 is formed and in which the vertically formed slots 8 and 9 are contained, a closer fit may be established between the piston and its cylinder during the assembly. Then when a motor equipped with these improved pistons is in operation upon the greatest expansion of the piston, the expanding forces against the peripheral surfaces of the pistons will engage the cylinder wall with a pressure only great enough to automatically accommodate a proper sliding relation of the piston relative to the cylinder, whereas the excess expanding or expansion will be carried out in the slots 4, 8 and 9 of the piston, thereby preventing undue frictional wearing of the piston against the cylinder.

The construction of the tongue shaped portion 3 is formed in the intermediate portion of the piston for the purpose of taking care of the expansion and contraction of said intermediate portion, said tongue shaped portion, however, also being assisted by the slot 9, wherein the slot 9 and lower

end of the slot 9 will provide for the expansion and contraction of the lower end of the piston.

In a piston of this improved character it is preferable to have the solid end 1 of the piston of a lesser diameter across the peripheral surface adjacent the piston ring recesses 2 than the remaining lower portion of the piston, said lesser diameter adjacent the solid end of the piston not being considered relative to this improved invention, as the usual type of piston rings mounted in the recesses will automatically take care of the proper expanding, contracting and packing relation relative to said solid piston end.

The slots 8 which adjoin the vertical slot 9 adjacent the piston ring recesses 2 prevent the expansion and contraction strains of the solid piston end 1 from traveling directly onto the side B of the piston, in which instance said strains will be dispersed along the wrist pin sides of the piston.

In order to take care of the aforementioned backlap of the piston which is generally given to the lower end of pistons from the throwing-thrust of the connecting rod, attention is called to the disposition of the vertically formed slots 8 and 9 which are diametrically opposite from one another and arranged at right angles to the wrist pin openings 10. These slots 8 and 9, however, weaken the lower portion of the piston relative to the expansion and contraction thereof, but in the disposition of said slots as mentioned the bending moment of the edges 11 thereof is transferred circularly therefrom, the side portions A and B in which the slots 8 and 9 are respectively located will provide a reinforcement to the piston against the connecting rod swinging-thrust.

As shown more clearly in Figs. 3 and 5, enlarged portions 12, each of which is reinforced by the rib 13, are provided for reinforcing the bearings formed by the wrist pin openings 10.

What I claim is:

1. A piston having a tongue-shaped portion formed on its peripheral face, and a longitudinally formed slot extending into said tongue portion.

2. A one piece piston closed at one end and having a pair of longitudinally arranged diametrically opposed slots formed in its peripheral face, thereby providing disconnected peripheral portions capable of moving outwardly or inwardly without restraint, and there being a transverse slot located adjacent the closed end of the piston adjoined intermediate of its ends by one of said other slots.

3. A piston having a pair of longitudinally arranged diametrically opposed slots formed in its peripheral face, one of said slots being shorter than the other slot.

4. A piston having a tongue-shaped portion formed on its peripheral face, a longitudinally formed slot extending into said tongue portion, and a second longitudinally formed slot diametrically opposed to said first-mentioned slot.

5. A piston having a solid end portion and a T-shaped slot formed in the peripheral face of the piston in which the transverse portion of said T-shaped slot is disposed adjacent the solid end of the piston, said slot forming adjacent disconnected peripheral portions which are capable of unrestrained outward and inward movement.

6. A piston having a solid end portion, a tongue-shaped portion formed on the peripheral face of the piston, having its face end located adjacent the solid end portion, and a longitudinally formed slot extending from the lower end of the piston into said tongue portion.

7. A piston having a tongue-shaped portion formed on its peripheral face, a T-shaped slot oppositely disposed from said tongue-shaped slot, and a longitudinally formed slot extending into said tongue portion.

8. A piston having a tongue-shaped portion formed on its peripheral face, a longitudinally formed slot extending into said tongue portion, and a second longitudinally formed slot diametrically opposed to said first-mentioned slot adjoining a transversely formed slot.

9. A piston having a solid end portion, a tongue-shaped portion formed on the peripheral face of the piston, having its free end located adjacent the solid end portion, a longitudinally formed slot extending from the lower end of the piston into said tongue portion, and a T-shaped slot disposed opposite from said tongue portion.

10. A one piece piston provided with a solid end portion and a skirt portion, said skirt portion having a longitudinally extending slot formed through the thickness of its wall, said slot extending from the rear edge of the skirt portion and forming adjacent disconnected portions in said skirt portion which are capable of being moved inwardly or outwardly without restraint.

ELMER C. LONG.

DEFENDANTS' EXHIBIT 4-H(14).
Prior Art Patent.
U. S. Patent No. 1,489,499, April 8, 1924,
To E. C. Long.
Piston for Internal Combustion Motors.
(Filed January 27, 1934.)

1732

April 8, 1924. 1,489,499

E. C. LONG

PISTON FOR INTERNAL COMBUSTION MOTORS

Filed Dec. 9, 1918

Fig. 1

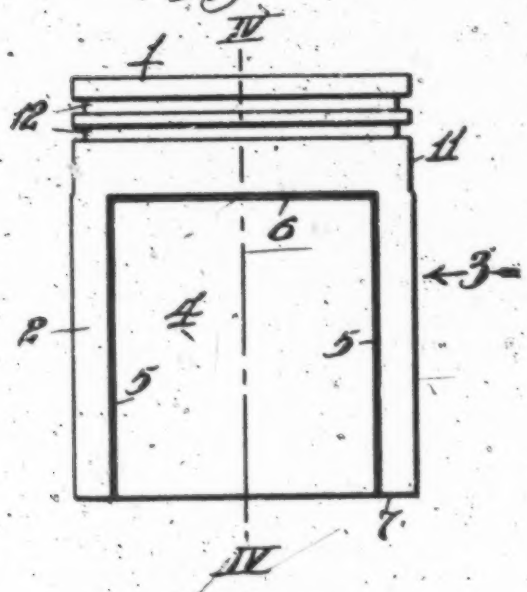


Fig. 2.

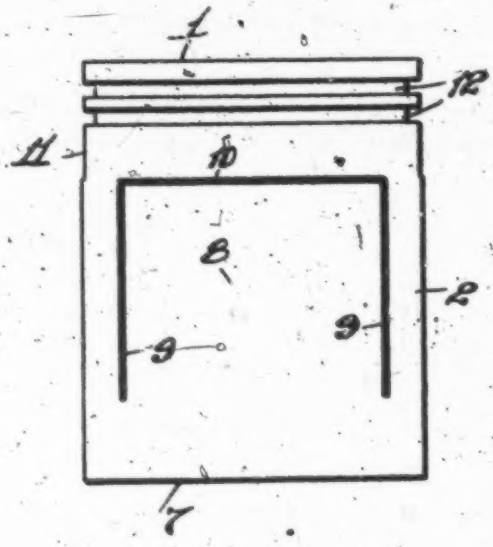


Fig. 3.

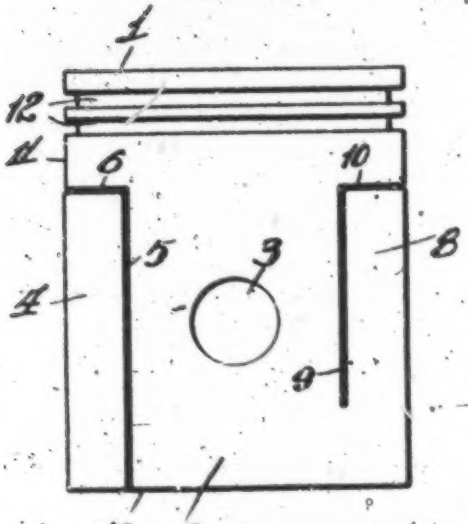


Fig. 4.

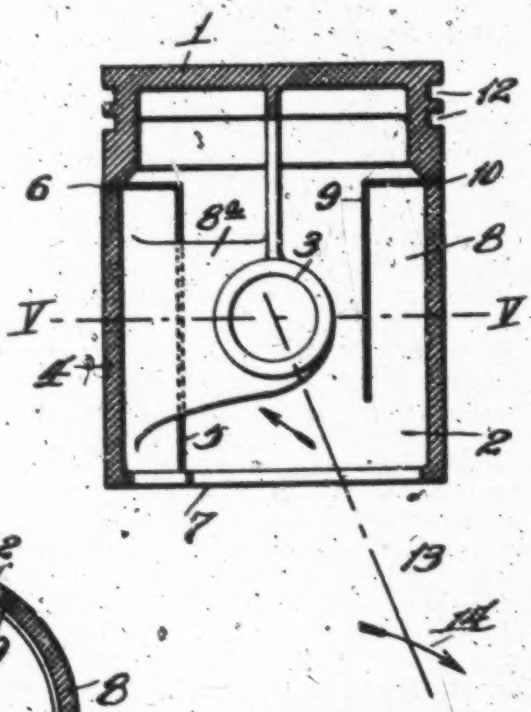


Fig. 5

Inventor:
Elmer C. Long.
By L. G. Fletcher.
Atty.

Patented Apr. 8, 1924. 1,489,499

UNITED STATES PATENT OFFICE. 1733

ELMER C. LONG, OF QUINCY, ILLINOIS.

PISTON FOR INTERNAL-COMBUSTION MOTORS.

Application filed December 9, 1918. Serial No. 265,948.

To all whom it may concern:

Be it known that I, ELMER C. LONG, a citizen of the United States of America, and a resident of the city of Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Pistons for Internal-Combustion Motors, of which the following is a specification.

The primary object of this invention is to provide an improved piston for internal combustion motors, whereby a better working relation is established between the piston and its cylinder during the operation of the motor under highly heated conditions.

Another object is to provide an improvement in a piston, whereby the working thrust due to the piston forcing the connecting rod is received by only one part of the piston surface, and not on the whole piston as heretofore.

Other and further objects will appear in the specification and be specifically pointed out in the appended claims, reference being had to the accompanying drawings exemplifying the invention, and in which,

Figure 1 is a side elevation of this improved piston.

Figure 2 is a side elevation opposite to that shown in Fig. 1.

Figure 3 is a side elevation taken in the direction of the arrow 3 in Fig. 1.

Figure 4 is a vertical section taken on the line IV—IV of Fig. 1.

Figure 5 is a transverse section taken on the line V—V of Fig. 4.

Referring to the drawings 1 designates a solid head of the piston, 2 the main body portion, and 3 the wrist pin bearings. Formed on one side of the main body portion 2, as shown more clearly in Fig. 1, is a cut out portion 4 which is formed in the periphery of the piston by the pair of longitudinal slots 5 and transverse slot 6, which adjoins the slots 5 adjacent the solid end 1 of the piston, said slots at their opposite ends continuing to the lower end 7 of the piston. The cut out portion 4 is held in its peripheral position by a pair of integrally formed connecting portions 8ª, each of said portions extending from each of the wrist pin bearings 3.

Formed in the piston periphery opposite to the cut out portion 4 is a tongue shaped portion 8, having its free end extend adjacent the solid end 1 of the piston, said tongue portion being separated from the body portion 2 of the piston by a pair of longitudinal slots 9 and a transverse slot 10, said slots 9 at their lower ends terminating at a distance from the end 7 of the piston.

From the aforesaid detailed construction of this improved piston, the body portion 2 thereof having the cut away portion 4 and tongue shaped portion 8 formed therein, will be resilient, as against the ordinary type of piston, and inasmuch as the exploding impulses of internal combustion motors are effective on the solid heads of the pistons, a higher temperature will be given to the solid piston end or head, as against the body portion of the piston on which is contained the cylinder engaging portion.

In this connection, with applicant's improved construction, since the body portion 2 or cylinder engaging portion has separated portions, independent contracting and expanding extents can be carried out in the piston between the body portion 2 and the solid head 1 of the piston.

Inasmuch as the cut out portions provide resiliency to the body portion 2 of the piston, in order to take care of the greatest amount of expansion of the solid head of the piston, the periphery of the piston adjacent the solid head is made smaller in diameter than the remaining portion of the piston, as designated at 11, as the piston rings when mounted in the recesses 12 will provide the cylinder fit for the solid head 1, whereas the cut out portion 4 and tongue shaped portion 8 of the body portion 2 of the piston will yieldingly bear against the cylinder wall.

In addition to the aforesaid, in the operation of this improved piston, when the piston is driving the connecting rod downwardly on the line 13, and in the direction of the arrow 14 in Fig. 4, the forcing thrust of the piston on the connecting rod is received by the connecting portions 8ª and borne by the cut away portion 4 against the cylinder wall, thereby relieving the remaining portions of the piston from the thrust, and hence forth preventing bending strains being carried to the tongue shaped portion 8, and consequently preventing back slap of the piston.

What I claim is:

1. A one piece piston having a portion entirely separated and unsupported from its peripheral face, between the wrist pin bearings thereof, the peripheral wall of said

piston which is oppositely disposed from said separated portion being slotted.

2. A piston having a portion separated and unsupported from its peripheral face, and a cut out tongue shaped portion formed in the periphery of said piston oppositely disposed from said separated portion.

3. A piston having a portion separated and unsupported from its peripheral face, means for supporting said separated portion from the interior of the piston, and a cut out tongue shaped portion formed in the periphery of said piston oppositely disposed from said separated portion.

4. A one piece full skirted hollow piston having a portion of its peripheral face entirely cut away, between the wrist pin bearings thereof thereby forming a separated peripheral portion, and supporting means secured to said separated portion and the wrist-pin bearings of the piston, for holding said separated portion in peripheral alinement with the peripheral face of the piston.

5. A piston having a solid end portion and a full skirt portion formed integral therewith, and there being a part of said skirt portion entirely cut away and wholly unsupported from the main body portion thereof.

6. A piston having a solid end portion and a skirt portion formed integral therewith, there being a part of said skirt portion entirely cut away and wholly unsupported from the main body portion thereof, and there being a tongue shaped portion formed in said skirt portion.

7. A hollow piston having a portion of its peripheral wall entirely cut away between the wrist pin bearings thereof, thereby forming a separated section, said peripheral wall bearing a slot in opposite disposition to said section and supporting means secured to said section and the wrist pin bearings of the piston for holding said section in alinement with the peripheral wall.

8. A full skirted one piece piston having a portion of its peripheral wall entirely cut away and wholly separated from the remaining portion of the peripheral wall, said cut away portion being integrally supported from the interior of the piston.

9. A one piece piston having a pair of slots cut entirely through the thickness of its peripheral wall, said slots leading from the open end of the piston to a point adjacent the lowermost packing ring recess thereof and being joined by a transversely extending slot thereby forming a disconnected portion, and integral means provided for supporting said disconnected portion between said slots.

ELMER C. LONG.

DEFENDANTS' EXHIBIT 4-H(15).
Prior Art Patent.
U. S. Patent No. 1,872,772, Aug. 23, 1932,
To E. C. Long.
Piston for Internal Combustion Motors.
(Filed January 27, 1934.)

1736

Aug. 23, 1932. E. C. LONG 1,872,772

PISTON FOR INTERNAL COMBUSTION MOTORS

Filed March 7, 1919

Fig. 1.

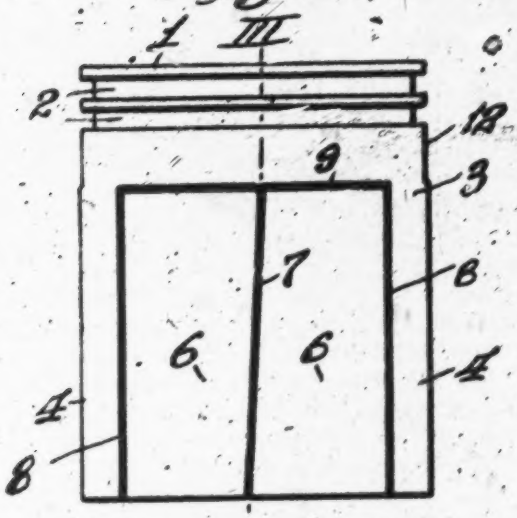


Fig. 2.

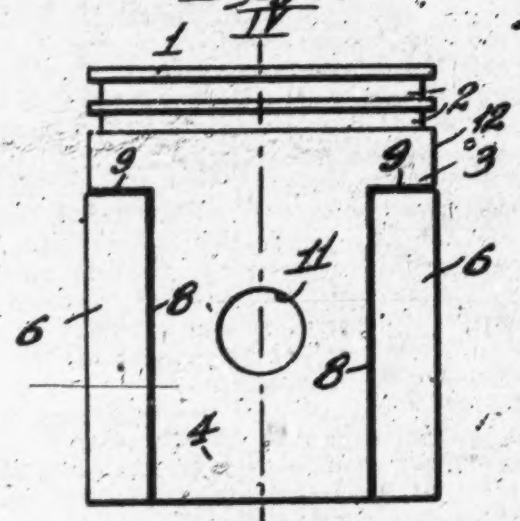


Fig. 3.

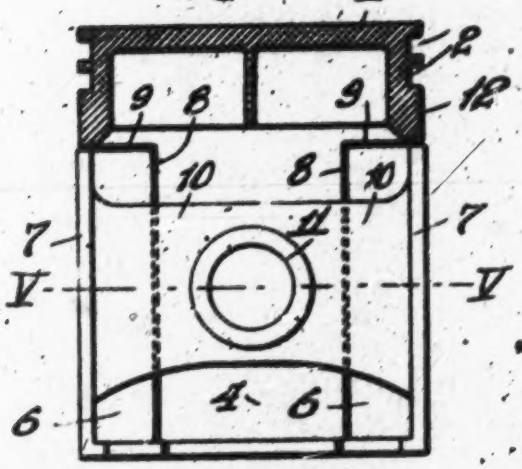


Fig. 4.

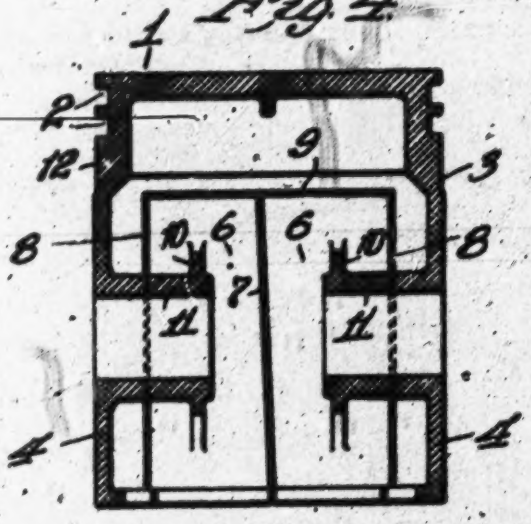


Fig. 5.

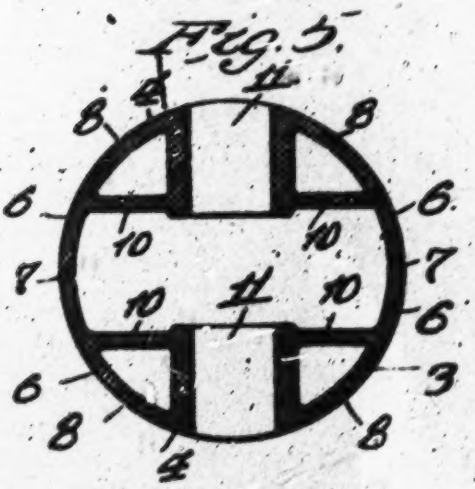
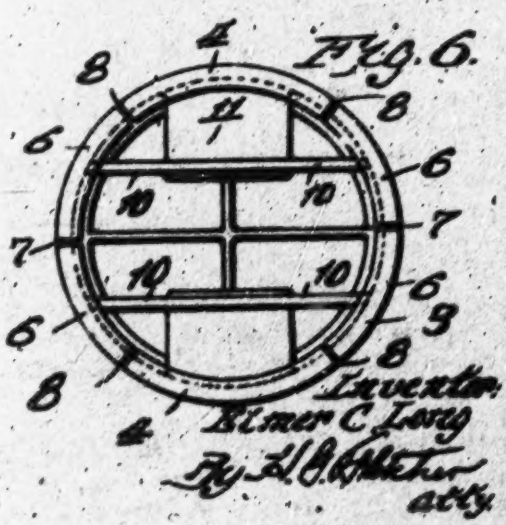


Fig. 6.



Inventor
Elmer C. Long
By L. B. Miller
Atty.

Patented Aug. 23, 1932

1,872,772

1737

UNITED STATES PATENT OFFICE

ELMER C. LONG, OF QUINCY, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SECURITY TRUST COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN

PISTON FOR INTERNAL COMBUSTION MOTORS

Application filed March 7, 1919. Serial No. 281,178.

The primary object of this invention is to provide an improved piston for internal combustion motors, whereby a better working relation is established between the piston and its cylinder during the operation of the motor under highly heated conditions.

Another object is to provide an improvement in a piston whereby the working thrust due to the piston forcing the connecting rod is received by certain parts of the piston only.

A further object is in providing an improved piston with means formed on that portion thereof which will engage the cylinder wall, whereby a better fitting relation can be given to the piston relative to the cylinder during the machining of the piston so that the fitting relation will be approximately the same during the operation of the motor in which this improved piston or pistons is contained.

Other and further objects will appear in the specification and be specifically pointed out in the appended claims, reference being had to the accompanying drawing exemplifying the invention, and in which,

Figure 1 is a side elevation of this improved piston.

Figure 2 is an elevation of the wrist pin side of the piston.

Figure 3 is a vertical section taken on the line III—III of Fig. 1.

Figure 4 is a vertical section taken on the line IV—IV of Fig. 2.

Figure 5 is a horizontal section taken on the line V—V of Fig. 3.

Figure 6 is an elevation of the lower end of the piston.

Referring to the drawing, 1 designates the solid end portion of the piston, having the usual piston ring recesses 2 and the main body portion 3, said main body portion having opposing wrist pin bearing sides or faces 4.

Formed in the periphery of the piston and in the body portion 3 thereof between the wrist pin side portions 4 and on each side of the piston is a pair of segmental portions 5, said pairs of portions 5 being divided by a slanting or inclining slot 7, and are further divided from the body portion of a piston by the vertical slots 8 and the transverse slot 9.

Each cut out portion 5 is held in its peripheral position by an integrally formed connecting portion 10, there being a pair of said connecting portions extending in opposite directions from each of the wrist pin bearings 11.

In the construction of this improved piston, the slots 7, 8 and 9 which form the segmented portions 5 are preferably cut in the body portion 3 of the piston, and in the machining of this piston the upper portion thereof adjacent the solid end 1 is turned to a lesser diameter than the body portion 3, as indicated by the numeral 12.

In setting forth the advantages gained by a piston of this improved construction, it will be necessary to call attention to the solid piston construction, in which the piston was turned down to a size considerably smaller than the diameter of the cylinder to allow for the expanding of the piston, the fit of the cylinder being provided by the piston or packing rings, but from experiment, it has been found that the pistons of internal combustion engines would at the same have too great an expansion, whereby considerable friction was created on account of the pistons fitting too tightly in the cylinder when the same became highly heated, and if the piston were turned down to a smaller diameter to avoid the extreme expanding fit of the piston during the highly heated condition, the piston would be too loose in the cylinder under normal conditions. Owing to providing the piston with segmental bearing faces against the cylinder wall. With this improved construction, on account of the segmental portions 5 provided An opposite diametral relation in the peripheral face of the piston, the body portion 3 thereof cut in material to a size slightly less in diameter than the cylinder wall so that when a motor equipped with this improved piston is put in operation, the piston fit is provided between the body portion of the piston and the cylinder under a small degree of heat, whereas when highly heated conditions exist the body portion of

the piston comprised of the wrist pin sides 4 and separated portions 6 can expand without fitting too tightly against the cylinder wall, as the expansion thereof will be taken up by the slots 7 and 11, as expanding and contracting resiliancy is given to the body portion 3 of the piston by the separated portions thereof.

The expanding fit given to the body portion 3 of the piston as just related will allow the upper portion of the piston adjacent the solid end 1 to be turned to a lesser diameter as indicated at 12 on account of the fact that a proper packing and fitting relation is provided when the piston rings are mounted in their respective recesses 2, as said upper portion of the piston will be turned down to such a degree whereby the extreme expansion of the piston will not cause the peripheral face of the upper portion of the piston to engage the cylinder wall at any time.

In addition to the connecting portions 10, supporting their respective separated portions 6 of the piston, said connecting portions 10 serve to reinforce said separated portions 6 and hold them outwardly against the forcing thrust of the connecting rod so that back slap of the piston is prevented as it is to be noted that said separated portions 6 are angularly arranged relative to the wrist pin bearings 11 of the piston.

Inasmuch as the separated portions 6 will be rigidly held against bending against the forcing thrust of the piston from the connecting rod of the piston, the dividing slanting slots 7 of the pairs of separated portions 6 will prevent the wearing of a raised portion in the cylinder wall.

What I claim is:

1. A one piece piston having a solid walled skirt portion, said skirt portion having a pair of sections of its peripheral wall entirely cut away thereby forming separated peripheral parts, and integral means for supporting said sections in peripheral alinement with the peripheral face of said skirt portion.

2. A piston having a solid walled skirt, said skirt having a pair of opposing portions of its peripheral wall entirely cut away, thereby forming separated peripheral portions, and integral supporting means secured to said separated portions and the wrist pin bearings of the piston for holding said separated portions in peripheral alinement with the peripheral face of the skirt.

3. A one piece piston having a full skirt portion, said skirt portion having opposing pairs of sections entirely cut away and wholly separated from its peripheral face, said sections being extended to one end of the piston.

4. A piston having a solid end portion and a skirt portion engaging the entire circumferential wall of the cylinder in which it reciprocates, said skirt portion having a series of sections which are wholly separated from one another, said skirt portion having a pair of wrist pin bearings formed integral therewith, and a rib extending from each of said bearings to a respective section.

5. A piston having a head and a cross-head structure connected thereto and comprising diametrically opposite slippers, wrist pin bosses between the slippers and means joining said bosses and slippers together, the said joining means being resiliently yieldable.

6. In a piston for an internal combustion engine, the combination of a piston head having a depending ring flange, two pairs of curved guide members oppositely disposed with relation to the axis of the piston, the curved members of each pair thereof being separated from the ring flange and from each other by continuous air gaps, and webs carrying wrist pin bosses, the said curved members, piston head and webs being united in an integral unitary structure.

7. In a piston for an internal combustion engine, the combination of a piston head having a depending ring flange, two pairs of curved guide members oppositely disposed with relation to the axis of the piston, the curved members of each pair thereof being separated from the ring flange and from each other by continuous air gaps, wrist pin bosses and webs connecting the wrist pin bosses with certain of said guide members, said guide members, piston head and webs being united in an integral unitary structure.

ELMER C. LONG.

DEFENDANTS' EXHIBIT 4-H(16).

Prior Art Patent.

British Patent No. 19,559 of 1890,

To James Roots.

(Filed January 27, 1934.)

[Second Edition.]

N° 19,559. A.D. 1890

Date of Application, 1st Dec., 1890

Complete Specification Left, 1st Sept., 1891—Accepted, 3rd Oct., 1891

PROVISIONAL SPECIFICATION.

Improvements in Petroleum or Liquid Hydrocarbon Engines.

I JAMES ROOTS 24 Adam Street Portman Square W. Engineer do hereby declare the nature of this invention to be as follows:—

The object of this invention is the prevention of the leakage of vapour and the consequent smell. For cylinders having pistons attached directly to the connecting rod, in which the piston acts also as the crosshead and the cylinder as a guide I cast an addition to the front of the piston of a deep-groove or U shaped section the smaller periphery of which casting is screwed or bolted to the piston and the other periphery is of the same diameter as the piston and carries a piston ring; the front view has the appearance of a disc with a long narrow slot to allow the movement of the connecting rod; the space within is deeper at the sides of the slot than at the end. The leaking vapour is caught and condensed in the space so formed and utilised for lubricating the piston, the remainder may be allowed to pass back by a pipe screwed in the cylinder or air may be drawn through it by means of a second small port. The connecting rod may be connected directly to the vapour catching cover instead of to the piston. For engines having a crosshead and guide I make both cylindrical and place one or more rings on the periphery of the crosshead so that it acts like a second piston the space between the two catching and condensing the petroleum vapour, or passing it to the reservoir.

Dated Nov. 28/90.

JAMES ROOTS.

COMPLETE SPECIFICATION.

Improvements in Petroleum or Liquid Hydrocarbon Engines.

I, JAMES ROOTS, of 24, Adam Street, Portman Square, London, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention has for its object, the prevention of any escape or leakage of petroleum vapour from the interior of the cylinder past the piston to the atmosphere, thereby avoiding the unpleasant smell usual to engines of this class as hitherto constructed.

It consists in providing that any escape or leakage of vapour past the piston becomes pocketted and condensed in an annular or other shaped chamber fitted to the piston. A portion of the condensed vapour caught in the space so formed is utilised for lubricating purposes, the remainder may be allowed to flow back to

[Price 8d.]

[Price/-

the reservoir by a pipe screwed into the cylinder, or it may be again drawn into the cylinder by the suction stroke of the piston by way of a small port provided for the purpose.

In order that my invention, and the manner of its application may be fully understood, I have appended the accompanying sheet of drawings, in which Figures 1 and 2 are a sectional plan and front sectional elevation respectively of an engine cylinder, in which the piston A is attached directly to the connecting rod B, the piston acting as the crosshead, and the cylinder as a guide.

To engines of this description, I fit an additional piece C with a deep groove D, the periphery at the front end being provided with a piston ring E, the neck F is of sufficient width and depth to allow of the free up and down movement of the connecting rod B (see Figure 2). In the chamber or space formed by the groove D, the vapour that passes the piston is caught and condensed to serve for lubricating purposes, as hereinbefore stated, and excess may be passed back to the reservoir by the pipe G.

Figures 3 and 4 represent the arrangement adopted for engines having crosshead and guide. The crosshead H is made cylindrical with one or more rings on its periphery forming, as it were, a second piston, the space or chamber D formed between the two pistons, pocketting and condensing the vapour in the same manner and for the same purpose, as described with reference to Figures 1 and 2.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed I declare that what I claim is:—

In petroleum or liquid hydrocarbon engines, forming a chamber attached to the piston for the purpose of catching and condensing the leaking vapour in (1) the manner described, and shown in Figures 1 and 2, and (2) the manner described, and shown in Figures 3 and 4.

The 1st day of September 1891.

H. GARDNER,
Patent Agent, 166, Fleet Street, London,
Agent for the said James Roots.

Redhill: Printed for Her Majesty's Stationery Office, by Malcomson & Co., Ltd.
[G. 4971—125—11/99

A.D. 1890. Dec. 1. N° 19,559.
ROOTES'S COMPLETE SPECIFICATION
(2nd Edition)
(1 SHEET)

FIG. 1.

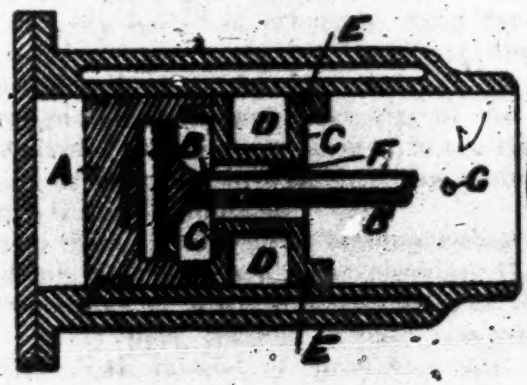


FIG. 2.

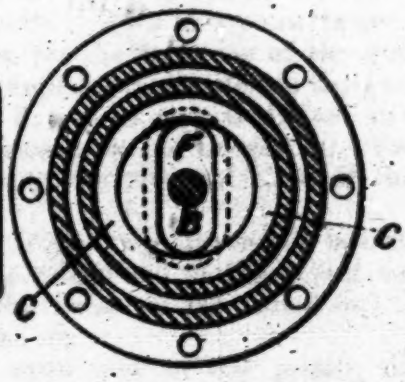


FIG. 3.

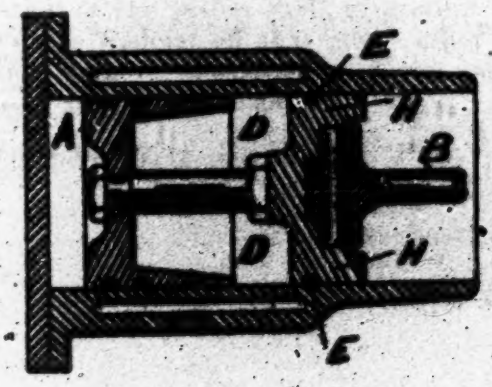


FIG. 4.

[This Drawing is a reproduction of the Original on a reduced scale]

1742

attachment of the stays to the closed end of the piston may be effected by forming the gudgeon supporting means into a truncated cone shaped piece extending towards the back of the piston and flanging this truncated cone shaped piece at that end which comes in contact with the closed end of the piston. Also in some cases the body of the piston may be provided with a circular recess and the gudgeon may be supported in a separate hat shaped piece with upturned circular flanges fitting inside the piston and bearing on the boss part. This turned-up flange is pierced and provided with bearings to receive the gudgeon pin, and the central part of the hat piece extends to the closed end of the piston and is suitably bolted or otherwise fixed thereto. With this construction it is not necessary to pierce the body of the piston for the reception of the gudgeon pin and the bulk of the force of the working fluid is transmitted to the gudgeon pin through the hat piece. The rim of the hat piece may if desired in some cases be riveted or otherwise secured to the recessed part of the piston. Ventilation may be provided conveniently by piercing the rim and sides of the hat piece in a suitable manner.

In some cases in which the bracing means from the gudgeon pin bearings to the back of the piston are made circular, the closed end of the piston may be bellied outwards or inwards so as to make the forces on the closed end of the piston, mainly pure tension or pure compression.

In some cases instead of providing the open end of the piston with a strengthening groove I prefer to use a bead or roll for the purpose of strengthening the open end of the same.

Further in those cases in which a number of connecting-rods are used or if a single connecting-rod be divided at its end, additional supporting means for the gudgeon pin may be supported on stays fixed to the rear end of the piston. In this way the centre part of a flat ended piston may be supported directly from the gudgeon pin and the pressure of the working fluid on the piston transmitted through the stays above mentioned. It is important to provide for ventilation of the piston shell to prevent overheating.

It will be understood that many other modifications might be made to this invention without departing from the spirit of the same as set out at the beginning of this specification.

Dated this 27th day of July, 1907.

MARKS & CLERK,
18, Southampton Buildings, London, W.C.
13, Temple Street, Birmingham, and
30, Cross Street, Manchester,
Agents.

COMPLETE SPECIFICATION.

"Improvements in and relating to Motor and other Pistons".

I, JOHN VERNON PUGH, of Uniting House, Allesley, in the County of Warwick, Engineer; do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:

This invention relates to improvements in the construction of pistons of the trunk type in which the body of the piston is formed of comparatively thin metal by pressing, stamping, spinning or similar manipulating means, and especially to pistons for internal combustion motors.

It has already been proposed to form the body of a piston in this way but practical difficulties arise in attaching the gudgeon pin to the piston body in a manner at once secure, convenient and light.

The object of the present invention is to overcome these difficulties hitherto associated with trunk pistons made of thin, rolled or otherwise treated metal.

The present invention consists broadly in providing a piston of the type above indicated, with a gudgeon pin supporting means arranged to add stability to the structure of the piston. More specifically this invention consists in attaching the gudgeon pin supporting means to the sides and or back of the piston body in such a manner as to securely attach said means to the piston and at the same time lend a bracing or supporting effect to the rear or top face of the piston which is subjected to the pressure of the working fluid.

Referring now to the accompanying drawings which form part of this specification:

Figure 1 shews a sectional elevation of one form of the present invention in which a hat shaped piece is secured to the flat end of the piston and also to the body of the same;

Figure 2 is a sectional elevation of a modification in which a circular cone shaped member is secured to the closed end of the piston and provided with bossed portions to surround the gudgeon pin;

Figures 3 and 4 shew in elevation and plan a construction in which two separate strut-like members are attached to the sides and closed end of the piston by riveting or other means;

Figure 5 shews a construction similar to that of Figure 2, with the addition of an extra supporting strut from the centre of the gudgeon pin to the closed end of the piston;

Figures 6 to 9 illustrate various forms of closed ends for the pistons;

Figures 10 to 12 illustrate a construction in which separate gudgeon pin supporting struts are used which are attached to the closed end and the sides of the piston, portions being continued downwards and attached at a low point to the piston. In this figure also are shewn additional pieces for imparting strength to the bossed portions of the piston body and the gudgeon supporting means. There is also shewn in this figure a convenient construction of gudgeon pin provided with expanding means for securing it within the piston.

In carrying the invention into effect according to one form—say as applied to the construction of a motor piston, the body, *a*, of the piston is rolled, stamped or otherwise formed out of thin sheet metal say—16, B.W.G. the outside form of the piston being of course provided with the usual recesses, *b*, for the piston ring or piston rings and with strengthening recesses, *c*. In addition to these recesses, there may be provided in the body, *a*, of the piston, a thin boss, *d*, on each side for the gudgeon pin but this boss would not of itself be of sufficient strength for the supporting of the gudgeon pin and the closed end, *e*, of the piston would not of course be sufficiently strong to give the necessary resisting strength to the pressure of the working fluid. In order to supply the closed end, *e*, of the piston with this necessary strength, the end may be made dome form either concave or convex as shown in Figures 6 and 7 but this construction has the disadvantage that it would not be applicable to the present shape and form of engine cylinders.

In the case of flat closed ends on the pistons as shewn in Figures 1, 2 and 5, I prefer to support the gudgeon pin, *f*, partly from the sides, *a*, and partly from the closed ends, *e*, of the piston by means of tubular members, *g*, attached to the sides and connected to the back or closed end, *e*, of the piston or by strut or stay members, *h*, see Figures 3 and 4 attached to the sides and closed ends of the piston. This tubular member or the ends of the struts may be welded or riveted to the body of the piston as shewn at, *j* or any other suitable form of fixing the gudgeon pin supporting means to the body of the piston may be employed. In some cases as shewn in Figures 10 to 12, portions, *a*, of the

strut-like members, *k*, may be continued downwards and attached to the body, *a*, by riveting or by other suitable means, portions of the body, *a*, being bulged in at the points, *v*, where the members, *k*, meet the body, *a*, in order that the heads of the rivets when rivets are employed may lie beneath the external surface of the piston.

The gudgeon supporting means may in some cases be provided with bent over flanges, *k*, by which they are fixed to the closed end, *e*, of the piston; these flanges, *k*, may be bent inwards as shewn in Figures 1, 2, 3 and 5 or outwards as shewn in Figure 1 on the right hand side.

The gudgeon supporting means are also provided with bossed out portions, *r*, to encircle the gudgeon pin. In some cases these bosses, *r*, are provided with strengthening pieces, *s*, surrounding them as shewn in Figures 10 to 12.

It will be seen that by this construction, the flat closed end, *e*, of the piston is braced and supported by means of the stays which are connected to the gudgeon supporting means. In this way the pressure of the working fluid is transmitted from the back of the piston to a great extent through the stays placed between the gudgeon supporting means and the closed end of the piston. The attachment of the stays to the closed end of the piston may be effected as shewn in Figures 1, 2, and 5, by forming the gudgeon supporting means into a truncated cone shaped piece extending towards the back of the piston and flanging this truncated cone shaped piece at that end which comes in contact with the closed end, *e*, of the piston. Also in some cases the body of the piston may be provided with a circular recess, and the gudgeon may be supported in a separate hat shaped piece, with upturned circular flanges fitting inside the piston and bearing on the boss part. This turned-up flange is pierced or bossed out and provided with bearings to receive the gudgeon pin and the central part of the hat piece extends to the closed end of the piston and is suitably bolted or riveted or otherwise fixed thereto. With this construction the bulk of the force of the working fluid is transmitted to the gudgeon pin through the hat piece. The rim of the hat piece may if desired in some cases be riveted or otherwise secured to the recessed part of the piston. Ventilation may be provided conveniently by piercing the rim or sides of the hat piece in a suitable manner.

In some cases the thin bosses, *d*, on the body, *a*, of the piston are provided with strengthening pieces, *t*, which may be riveted or otherwise secured to the body, *a*. this modification is shewn in Figures 10 to 12.

In some cases in which the bracing means from the gudgeon pin bearings to the back of the piston are made circular, the closed end of the piston may be bellied outwards or inwards *m m* to make the forces on the closed end of the piston, mainly pure tension or pure compression, as shewn in Figures 8, 9, 10, 11.

In some cases instead of providing the open end of the piston with a strengthening groove, *m*, I prefer to use a bead or roll, *n*, for the purpose of strengthening the open end of the same, as shewn in Figure 2.

Further in these cases, (see Figure 5) in which a number of connecting rods are used or if a single connecting rod, *o*, be divided at its end, additional supporting means for the gudgeon pin, *f*, may be provided by means of stays, *g*, fixed to the rear end, *e*, of the piston. In this way the centre part of a flat ended piston may be supported directly from the gudgeon pin and the pressure of the working fluid on the piston transmitted through the stays, *g*, above mentioned. It is important to provide for ventilation of the space between the gudgeon pin supporting means and the piston shell to prevent overheating.

It is to be understood that the bossed strengthening pieces, *t* or *s*, described above with reference to Figures 10 to 12 may be employed with any of the other modifications described. Further in some cases as in Figures 3 and 4, the bosses, *d*, are omitted and their place is taken by plain holes in the body, *a*,

of the piston, the bosses, *r*, in this case being extended out from the strut portions, *h*, sufficiently to meet the body, *a*.

Any suitable arrangement for securing the gudgeon pin may be employed, the form illustrated in Figures 10 to 12 being illustrative of one form only.

It will be understood that many other modifications might be made to this invention without departing from the spirit of the same as set out at the beginning of this specification.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A trunk piston having a body formed of comparatively thin metal by pressing, stamping, spinning or similar manipulating means, and gudgeon pin supporting means arranged to add stability to the structure of the piston, said supporting means being formed of comparatively thin metal by pressing, stamping, spinning or similar manipulating means, substantially as described.

2. In a piston according to Claim 1, gudgeon pin supporting means comprising a tubular body part having bossed out portions projecting towards inwardly bossed portions on the piston body arranged to embrace the gudgeon pin, and attached to the closed end of the piston by riveted flanges, welding or the like with or without flanges or extended portions for attachment to the sides of the piston body near the open end, substantially as described.

3. In a piston according to Claim 1, gudgeon pin supporting means as set forth in Claim 2, additional strut members between the centre portion of the gudgeon pin and the closed piston end, substantially as described.

4. In a piston according to Claim 1, gudgeon pin supporting means comprising stamped, pressed or otherwise suitably manipulated metal strut members having bossed portions to encircle the gudgeon pin and extended portions for attachment to the closed end and sides of the piston body, substantially as described.

5. The improved pistons hereinbefore described, with reference to the accompanying drawings.

Dated this 22rd day of January, 1908.

MARKS & CLERK,
18, Southampton Buildings, London, W.C.
13, Temple Street, Birmingham, and
30, Cross Street, Manchester,
Agents.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1908.

A.D. 1907. JULY 27. No. 17,256.
PUGH'S COMPLETE SPECIFICATION.

(2 SHEETS)
SHEET 1.

[This Drawing is a reproduction of the Original on a reduced scale]

Fig.1.

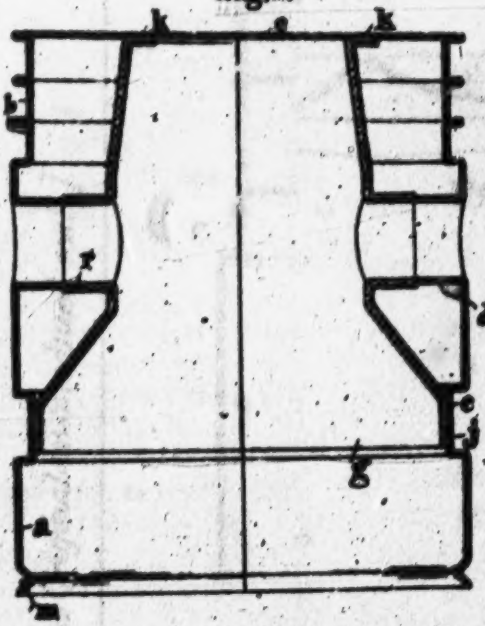


Fig.3.

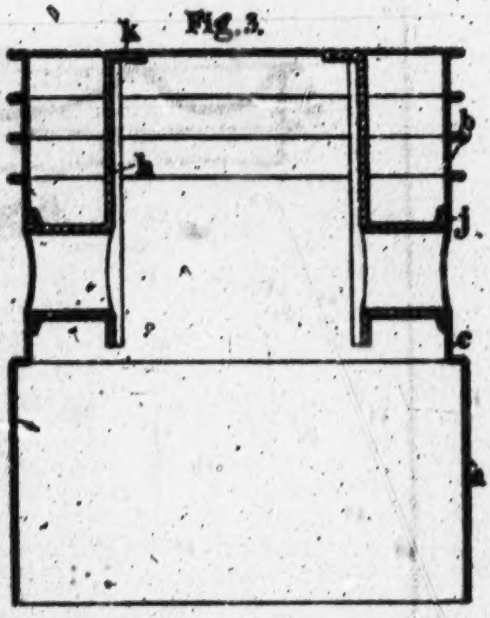


Fig.2.

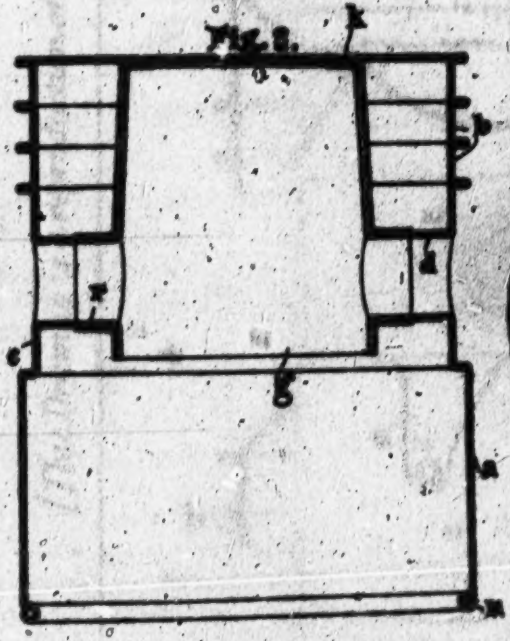
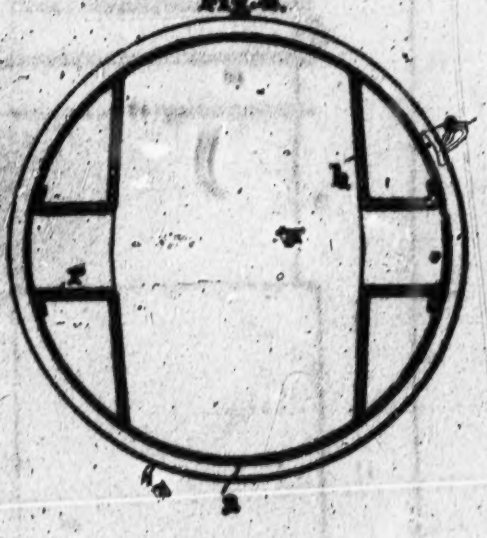


Fig.4.



Malby & Sons, Photo-Litho.

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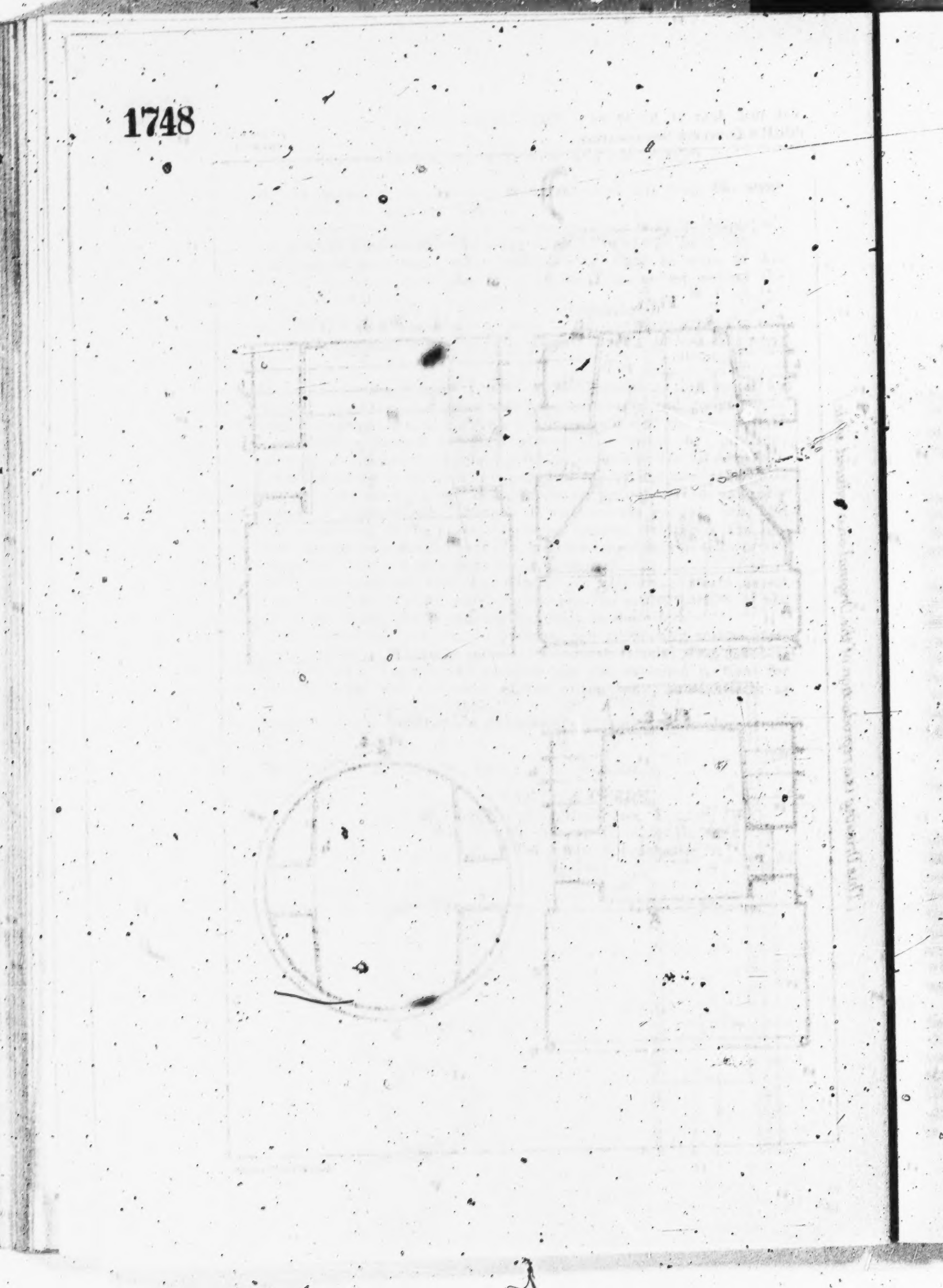


17256

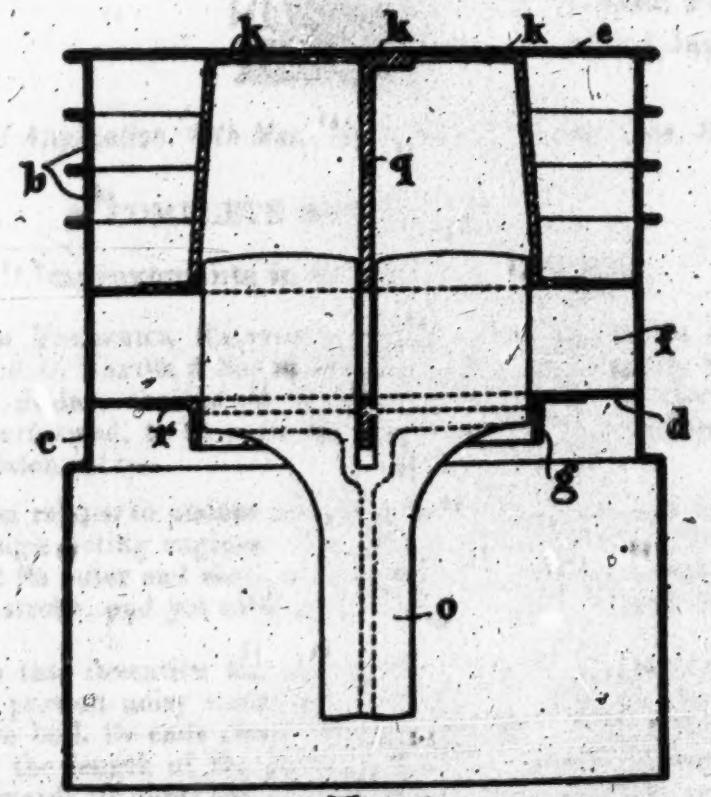


Fig.5.

Fig.6.

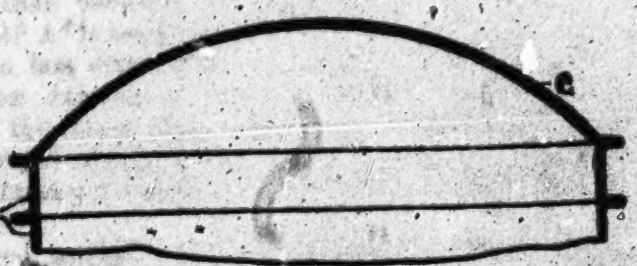


Fig.7.

Fig.8.

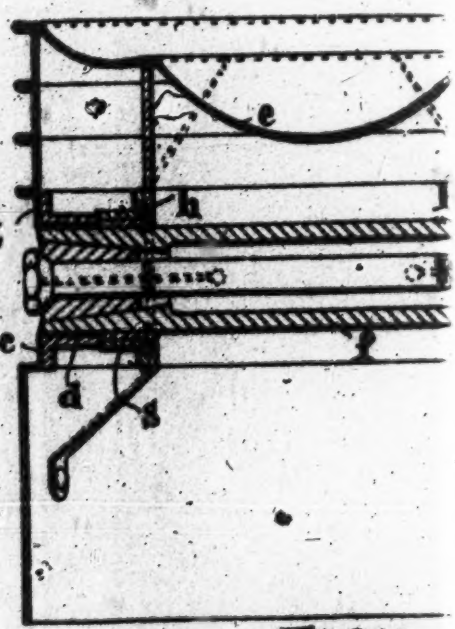


Fig.10.

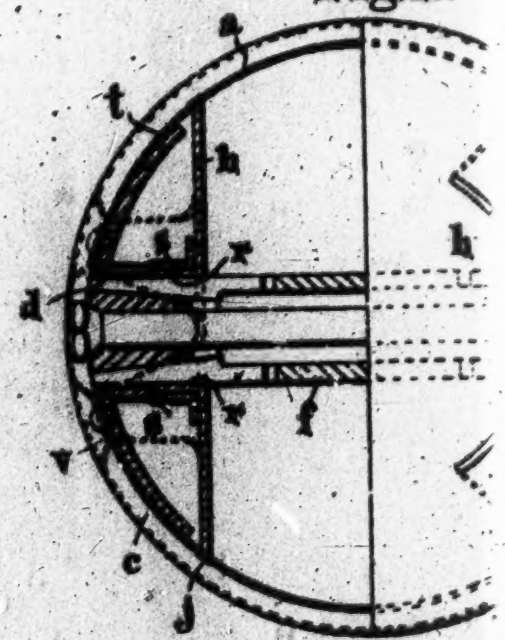
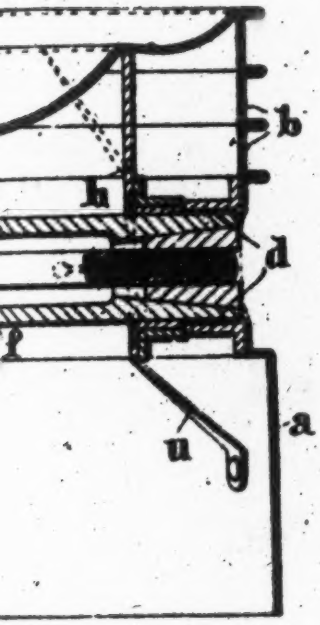
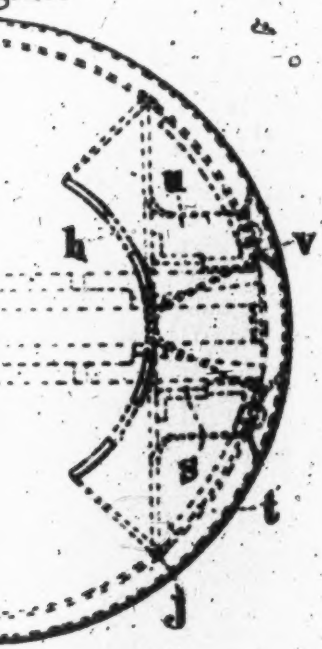


Fig.12.

[This Drawing is a reproduction of the Original on reduced scale]



g.10.



g.12.

Fig.9.

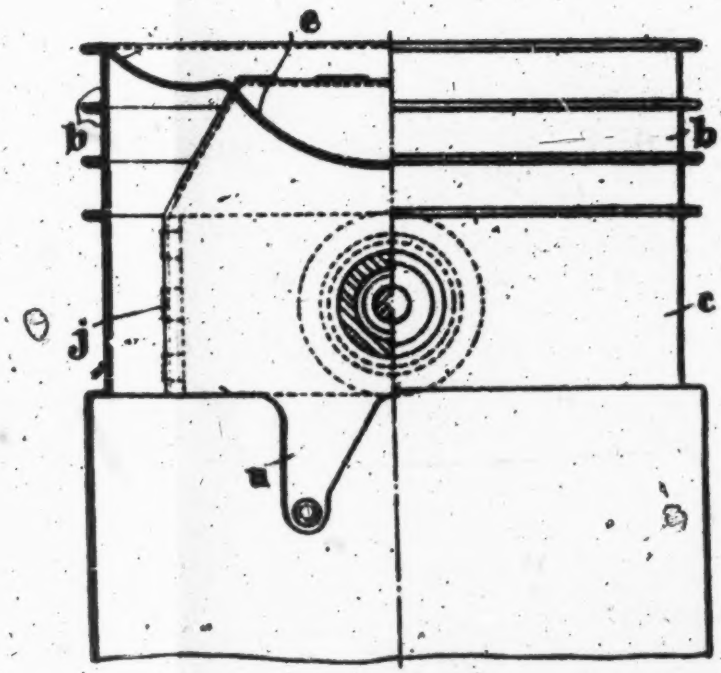


Fig.11.

DEFENDANTS' EXHIBIT 4-H(18).
Prior Art Patent.
British Patent No. 6826 of 1912,
To William Frederick Rainforth.
(Filed January 27, 1934.)

N° 6826

Date of Application, 19th Mar., 1912—Accepted, 20th June, 1912

COMPLETE SPECIFICATION.

Improvements in or relating to Pistons.

We, WILLIAM FREDERICK RAINFORTH, Engineer, of 1, Acacia Road, Acton, London, W., and D. NAPIER & SON, LIMITED, Engineers, of Acton Vale, London, W., do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to pistons and in particular to pistons of the trunk type as used with single acting engines. The object of the invention is to produce a piston which at its outer end shall so fit the cylinder as not to knock therein at the reversal of stroke, and yet such as will not be liable to seize from being too good a fit.

According to this invention the piston has one end slit to provide yielding portions which prevent noisy working. One or more slits may be used each of which may have both its ends closed and they may be made with their general direction along the length of the piston. The piston may conveniently have a portion at or towards its outer end of enlarged diameter and slit, whereby it may be sprung into the cylinder. The slits may be of any desired number and may be arranged either parallel to the direction of stroke, or inclined thereto, and in order to promote lubrication and prevent scoring, the inner end of one slit, when these are inclined to the length of the piston, may be arranged to overlap the path of the outer end of the next adjacent slit.

In the accompanying drawings—

Figure 1 is an elevation showing one construction of piston according to this invention, and

Figure 2 is a similar view of a modification.

The piston A is an ordinary construction so far as the inner end thereof, the rings B and the gudgeon pin C, are concerned, but between the points A^1 A^2 the diameter is larger than between the points A A^1 while the extreme outer end between the points A^2 A^3 is reduced either to the same diameter as that between A and A^1 or even to a less size. Slits D are formed in the wall of the piston at the enlarged portion extending along the whole length of that portion and slightly beyond at the inner end. Each end of each slit is terminated by a circular enlargement D^1 which serves both to facilitate the operation of slitting with a saw, and to form a suitable termination to the slit from which cracks are not liable to occur.

In use the enlarged portion would not enter the cylinder freely, but owing to the presence of the slits, this portion can be slightly sprung sufficiently to enable the piston to enter the cylinder. The pressure of the sprung portions upon the walls of the cylinder prevents the outer end of the piston from having any play therein, so that at each reversal of stroke this end does not knock from side to side in the cylinder and thus the noise usually arising from such knocking is eliminated. At the same time the danger of the piston seizing at this portion is reduced to a minimum owing to the springy action produced by the slits.

The slits may be arranged to any desired number and may either be parallel

to the length of the piston or inclined thereto as shown in Figure 2. When inclined to the length of the piston the inner end of one slit may be arranged to overlap the path of the outer end of the next adjacent slit, so preventing scoring. The action of the slits is further such as to promote lubrication of the outer end of the piston and this action is enhanced when the slits are inclined as shown in Figure 2.

Obviously the slits may be arranged in a variety of ways; those hereinbefore described and illustrated are formed with both ends left closed, but they may, if desired be extended toward the outer end of the piston so as to be open at that end. If closed, as shown, the spring-like action of the intervening strips is stiffer than if the slits are continued to the outer end of the piston. Again the slits need not necessarily be straight, although straight slits are of course easier to produce by ordinary methods than curvilinear slits. Again a U-shaped slit may be formed in the outer portion of the piston, the length of the U being transverse to the axis of the piston, and transverse slits may be arranged in a variety of ways to produce springy tongue-like portions which shall produce the required result in a manner similar to that in which the slits D act.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that we are aware that it has previously been proposed to cut slots in a piston for lightness and we do not claim broadly a slotted piston, but what we do claim is:—

1. A piston slit at one end in order to provide yielding portions which prevent noisy working substantially as described.

2. A piston according to preceding Claiming Clause No. 1 which has one or more slits with closed ends the general direction of the slits being along the length of the piston.

3. A piston having a portion at or towards its end of enlarged diameter and slit whereby it may be sprung into the cylinder substantially as and for the purpose described.

4. A piston according to any one of the preceding claiming-clauses wherein the slits are inclined to the length of the piston either so that the inner end of one slit overlaps the path of the outer end of the next adjacent slit or so as not to overlap substantially as and for the purpose described.

5. The trunk piston substantially as described and illustrated in the accompanying drawing.

Dated this 19th day of March, 1912.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London, E.C.,
Chartered Patent Agents.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1912.

A.D. 1912. March 29. No. 6826.

RAINFORTH & others' Complete Specification.

(1 SHEET)

Fig. 1.

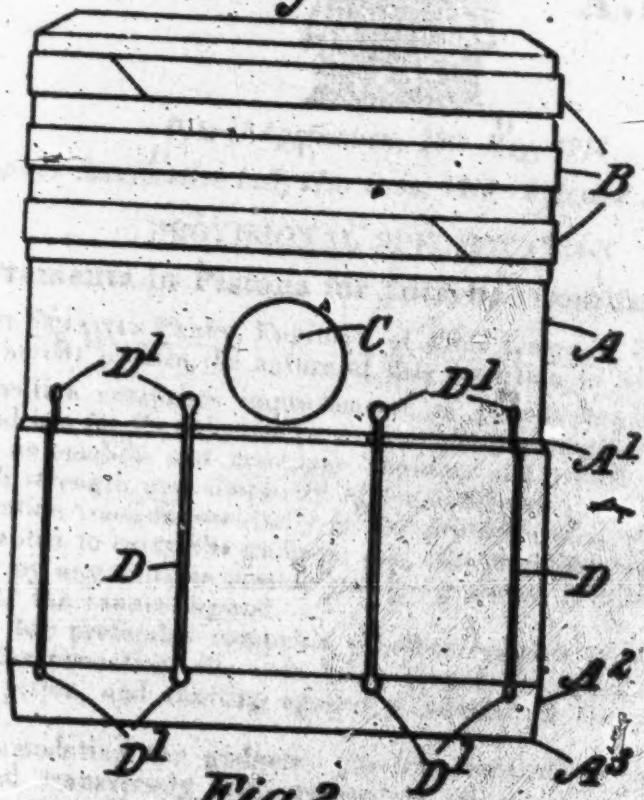
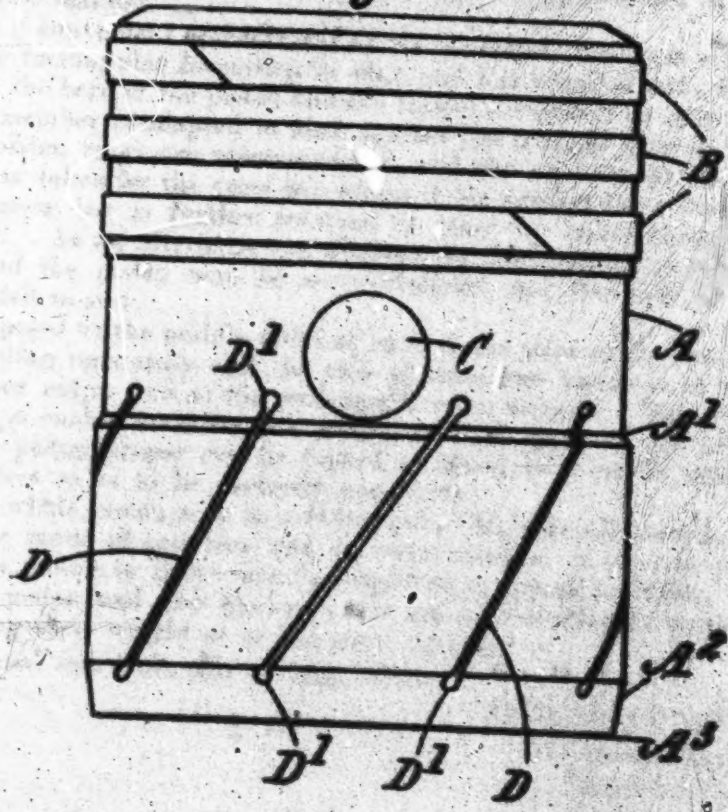


Fig. 2.



[Reduced from the Original as amended, scale]

DEFENDANTS' EXHIBIT 4-H(19).
Prior Art Patent.
British Patent No. 12,772 of 1914,
To Samuel Octavius Ferry.
(Filed January 27, 1934.)

(19) 1755

N° 12,772 A.D. 1914

Date of Application, 25th May, 1914
Complete Specification Left, 27th June, 1914—Accepted, 3rd Dec., 1914

PROVISIONAL SPECIFICATION

Improvements in Pistons for Internal Combustion Engines.

I, SAMUEL OCTAVIUS FERRY, Engineer, of Athol Lodge, S. Leonards, Ringwood, Hants, do hereby declare the nature of this invention to be as follows:—

This invention comprises improvements in pistons for internal combustion engines, and has for its object to provide a "featherweight" piston particularly for use in automobile and aeroplane engines, and which will combine light weight with strength and simplicity of construction.

The invention consists essentially in the provision of a separate cross bar or member adapted to carry the gudgeon pin, this cross bar being attached to the piston body by any suitable means, and being slotted to allow of the necessary movement of the connecting-rod.

The cross bar preferably comprises a hollow member of substantially oblong or rectangular formation, the ends being turned or formed to fit the internal bore of the piston, and abutting against a shoulder on the piston or a reduced bore thereof.

For accommodating the gudgeon pin the member is preferably provided centrally and transversely with respect to its main axis, with two bored bosses, on opposite sides, the gudgeon pin being fastened in these bosses in any suitable manner.

In a convenient embodiment of the invention, the cross member is of substantially rectangular formation in plan and has rounded ends which are concentric with the bore of the piston and are turned accurately so as to fit securely therein. The member is adapted to abut against the reduced bore of the piston in which the piston rings are accommodated, and the working pressure of the piston on load is taken by the cross bar where it fits against the reduced bore referred to. The cross bar is further retained in place by rivets through the wall of the piston. As an alternative or addition to this manner of securing, the internal bore of the piston may be screw-threaded and the ends of the cross member threaded to suit.

Disposed at the middle point of each of the sides of the cross member is a boss projecting outwardly and the axis of these two bosses is at right angles to the main or major axis of the rectangular cross member. These bosses are suitably bored to enable insertion and retention of the gudgeon pin in place.

The piston proper can be turned or bored both on its internal and external diameters so as to be perfectly concentric.

The whole piston may be constructed of high tensile steel or the piston proper may be made of cast iron and the cross member of steel as preferred, or other suitable metals or alloys may be employed as appear desirable.

The piston and also the cross bar are advantageously drilled with holes for reducing their weight as in the usual manner.

Dated this 25rd. day of May, 1914.

SAMUEL OCTAVIUS FERRY.
By George Harker & Brettell,
Chartered Patent Agents,
77, Colmore Row, Birmingham,
Agents for Applicant.

[Price 8d.]
PRICE 1/-

COMPLETE SPECIFICATION.

Improvements in Pistons for Internal Combustion Engines.

I, SAMUEL OCTAVIUS FERRY, Engineer, of Athol Lodge, S. Leonards, Ringwood, Hants, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention comprises improvements in pistons for internal combustion engines, and has for its object to provide a "featherweight" piston particularly for use in automobile and aeroplane engines, and which will combine light weight with strength and simplicity of construction.

The present invention relates to pistons of the type having a separate cross-bar or member adapted to carry the gudgeon pin, this cross-bar being attached to the piston body by any suitable means; and according to the invention this cross-bar comprises a hollow member of substantially oblong or rectangular formation, the ends being turned or formed to fit the internal bore of the piston, and abutting against a shoulder on the interior of the piston or a reduced bore thereof.

For accommodating the gudgeon pin the cross-member is preferably provided centrally and transversely with respect to its main axis, with two bored bosses on opposite sides, the gudgeon pin being fastened in these bosses in any suitable manner.

It will be understood that the invention may be embodied in several different constructions and forms of piston, but I will describe as an example a convenient embodiment of the invention for use particularly in automobile work.

This embodiment is illustrated in the drawings in which:

Figure 1 represents a longitudinal view in cross-section taken on line 1—1 of Figure 2.

Figure 2 is a view similar to Figure 1 but turned through an angle of 90° and being taken on line 2—2 of Figure 1.

Figure 3 is a cross sectional view on line 3—3 of Figure 1.

The piston body (which is represented by the numeral 1) is itself reduced in thickness as far as is feasible so as to be particularly light and two large openings 2, 2, are formed therein to provide a further reduction in weight. At the top of the piston two grooves are provided for the accommodation of piston rings 3 and the piston at this portion is provided interiorly with a reduced bore which forms a shoulder, the function of which will be hereinafter described. The bottom end of the piston is provided with a small inwardly projecting concentric flange 5 in accordance with usual practice.

The cross-member which forms the main part of the present invention is of substantially rectangular formation in plan as shown in Figure 3 and has rounded ends 7 which are concentric with the bore of the piston and are turned accurately to fit securely therein. The upper edge of the cross-member 6 is adapted to abut against the shoulder in the upper portion of the interior of the piston and the working pressure of the piston on load is taken by the cross bar 6 where it fits against this shoulder.

To retain the member 6 in position rivets 8 are provided whereby the same is firmly attached to the piston body 1. As an alternative or an addition to this manner of securing the internal bore of the piston may be screw-threaded and the curved ends 7 of the cross-member itself threaded to suit.

Disposed at the middle point of each of the sides of the cross-member 6 is a boss 9 projecting outwardly and the axis *a a* of these two bosses is at right angles to the main or major axis *b b* of the rectangular member. The bosses 9

are suitably bored to permit insertion of the gudgeon pin 10 in place, and to maintain the latter in position a tapered peg or wedge 11 is forced through a tapered hole formed continuously through one of the bosses 9 and one end of the gudgeon pin 10.

To give further lightness to the complete device two circular perforations 12 are provided which are continued through the ends of the rectangular member 6 and through the wall of the cylinder 1 corresponding thereto.

The piston proper 1 is turned or bored on both its internal and external diameters so as to be perfectly concentric and it will be seen from Figure 2 that the body 1 is of reduced diameter at 13, the portion below this zone of reduced diameter serving to act as a bearing surface to maintain the piston in alignment with respect to the cylinder when working as in usual practice.

The whole of the piston including the piston body 1 and the rectangular cross-member 6 may be formed of high tensile steel or the piston proper may be made of cast iron and the cross-member of steel as preferred or other suitable metals or alloys may be employed as appear desirable or advisable.

Having now particularly described and ascertained the nature of this invention, and in what manner the same is to be performed, I declare that what I claim is:—

1) A piston for use in connection with internal combustion engines, and of the type having a separate cross-bar or member adapted to carry the gudgeon pin, this cross-bar or member being attached to the piston body by any suitable means; characterised in that the cross-bar comprises a hollow member of substantially oblong or rectangular formation, the ends being turned or formed to fit the internal bore of the piston and abutting against a shoulder on the interior of the piston or a reduced bore thereof.

2) A piston as set forth in Claim 1 wherein the cross-member is provided centrally and transversely with respect to its main axis with two bored bosses on opposite sides, the gudgeon pin being fastened in these bosses in any suitable manner.

3. A featherweight piston for use in connection with internal combustion engines constructed substantially as described and illustrated.

Dated this 26th. day of June, 1914.

SAMUEL OCTAVIUS FERRY.
By George Barker & Brettell,
Chartered Patent Agents,
77, Colmore Row, Birmingham,
Agents for Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1914.

1758 A.D. 1914. MAY 25. No. 12,772.

FERRY'S COMPLETE SPECIFICATION.

(2 SHEET)

[This Drawing is a reproduction of the Original on a reduced scale]

FIG. 1

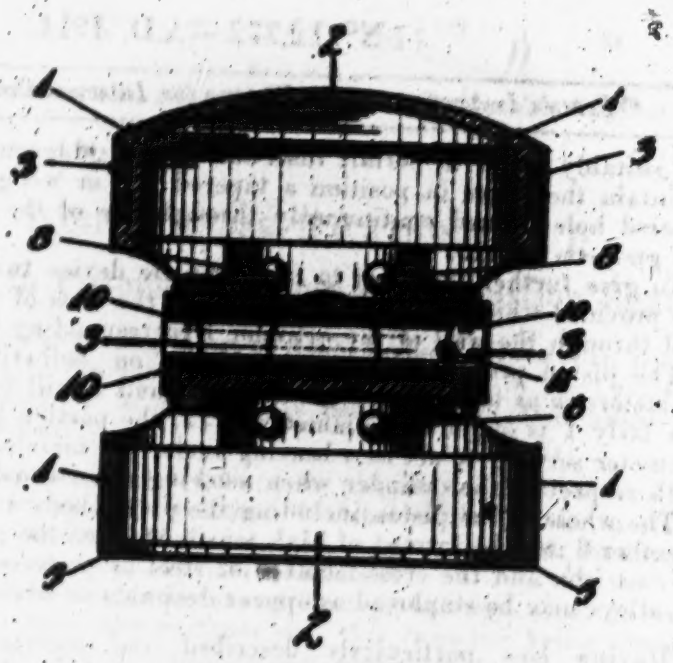


FIG. 2

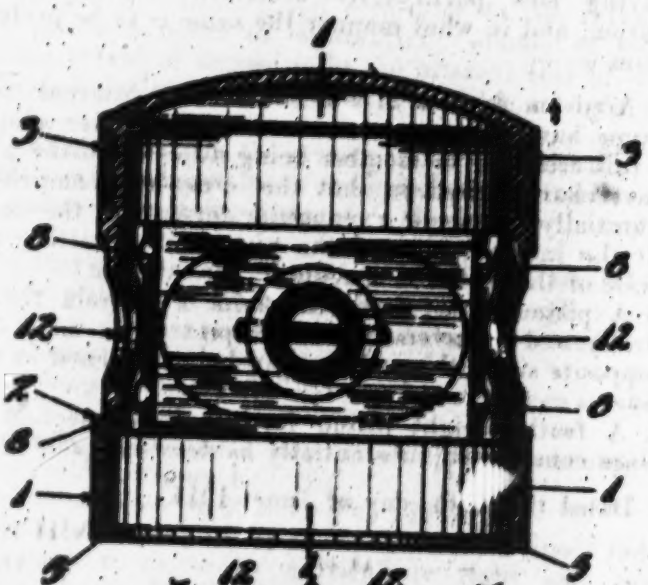
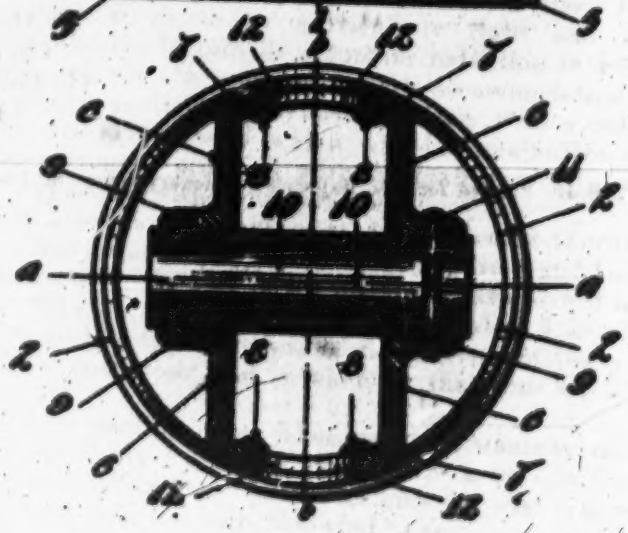


FIG. 3



DEFENDANTS' EXHIBIT 4-H(20).

1759

Prior Art Patent.

British Patent Specification No. 140,988,

(20)

[Second Edition.] To Ernest Walter Hives.

(Filed January 27, 1934.)

140,988

PATENT SPECIFICATION

Application Date, Nov. 4, 1919. No. 27,155/19.

Complete Accepted, Apr. 6, 1920.

COMPLETE SPECIFICATION.

Improvements in Pistons for Reciprocating Engines.

We, Ernest Walter Hives, of Station Road, Mickleover, Derby, Engineer, and Rolls-Royce Limited, of Nightingale Road, Cumnaston, Derby, Motor Car Manufacturers, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to pistons of the trunk type, that is those in which the duty of the piston proper is combined with that of a crosshead, the walls of the cylinder acting as the crosshead guide.

In this type of piston owing to the angularity of the connecting rod at the power stroke there is a tendency to thrust the piston against one side of the cylinder, which causes a noise commonly known as "piston knock" or "piston slap". This is more noticeable in internal combustion engines and especially in those engines which otherwise are comparatively noiseless.

This is generally eliminated by making the piston with a very small clearance.

In some cases however, the end desired cannot be thus secured, such as for example where the piston is made of aluminium (in order to secure well known advantages) and the cylinder is of cast iron, in which case owing to the greater co-efficient of expansion of aluminium over that of cast iron it is necessary to allow a greater clearance, with the result that when the engine is started before the metals have expanded under the effect of the heat, a "knock" is perceptible. The object of this invention is to eliminate the "knock" in such cases.

According to this invention we attain the object by saw-cutting or splitting the skirt circumferentially at a suitable distance from the lower edge of the piston and on the side of the piston remote from that side of the cylinder against which the piston is thrust on the power stroke owing to the angularity of the connecting rod, and another saw cut or division of the skirt axially (but preferably slightly spiralled) from the first saw cut to the edge of the skirt.

In another form of our invention instead of one circumferential saw cut and an axial cut from thence to the edge of the skirt we may make two circumferential saw cuts and an axial cut extending from one to the other.

The effect of such saw cuts is to give an elasticity to that part of the skirt between the circumferential saw cut and the edge, or between the two circumferential saw cuts as the case may be, and thus enable us, as we do to machine that part slightly oval so that when cold the piston is held in close contact with the other side of the cylinder, and yet when heated that part of the skirt can contract and avoid risk of seizure.

[Price 1/-]

We are aware that it is not new to [illegible] or saw-cut a piston skirt axially, but such an arrangement has the disadvantage that the pressure exerted by the tongue or tongues so formed is not sufficiently distributed over the cylinder walls and the reactions on the piston are not such as to control the piston as desired, an objection which our invention overcomes to a large extent.

The accompanying drawing illustrates one form of our invention in which there is one circumferential saw-cut applied to an aluminium trunk piston for internal combustion engines. Fig. 1 being an external elevation showing the saw-cuts and Fig. 2 a section on the line A A of Fig. 1.

a is the circumferential saw cut, a^1 the axial saw-cut slightly spiralled, *b* is the gudgeon pin supported by bosses b^1. *c* are pressure retaining rings and c^1 pegs or dowels to prevent same from turning, *d* is an oil scraper ring d^1 a groove and d^2 holes to return surplus oil to crankcase.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. A trunk piston for reciprocating engines having the skirt split or saw-cut circumferentially for a portion of its circumference on the side remote from the side of the cylinder taking the side thrust due to the angularity of the connecting rod on the power stroke, and a second saw-cut axially or slightly spiralled relative to the axis of the piston from the first saw-cut to the edge of the skirt.

2. A trunk piston for reciprocating engines having two circumferential saw cuts on the side remote from the side of the cylinder taking the side thrust due to the angularity of the connecting rod on the power stroke, and a saw cut from one to the other of the said circumferential saw cuts axial or slightly spiralled relative to the axis of the piston.

3. A trunk piston for reciprocating engines constructed of aluminium with saw cuts as claimed in Claims No. 1 and No. 2.

4. An aluminium trunk piston for reciprocating engines as illustrated in the drawings.

Dated the 4th day of November, 1919.

CLARKSON, HAYNES & Co.,
Vernon House, Bloomsbury Square, W.C. 1,
Agents for the Applicants.

Hereford: Printed for His Majesty's Stationery Office, by The Hereford Times Ltd.
[Wt. 70—128/8/1922.]

1761
29

140,902. HIVES à cadre's CONVERTIBLE SIMULTANÉES.

2nd Edition

1 SHEET

[This Drawing is a reproduction of the Original on a reduced scale]

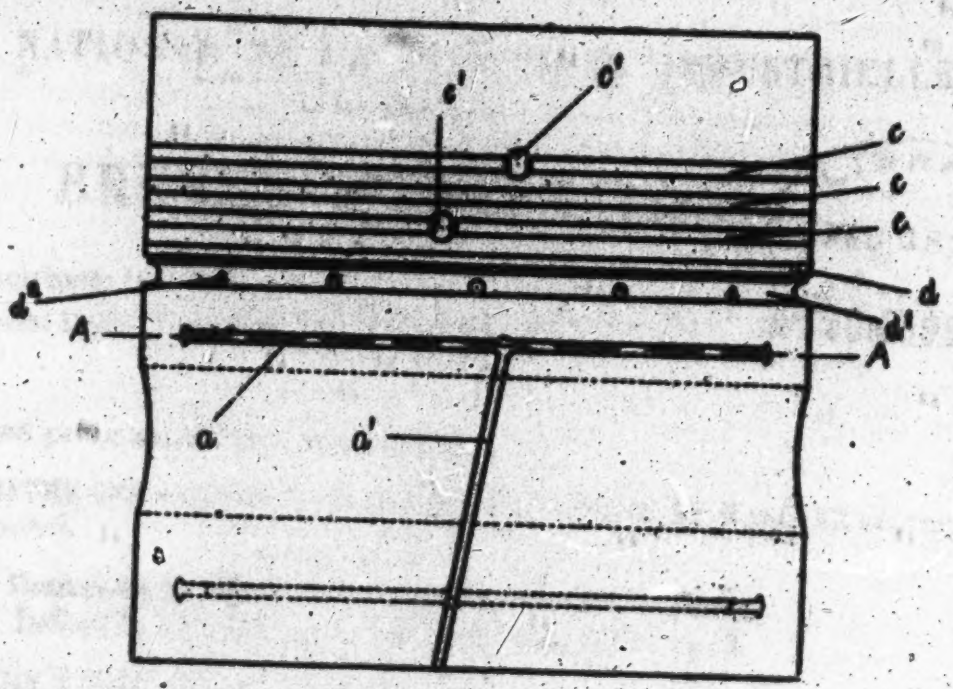


Fig 1

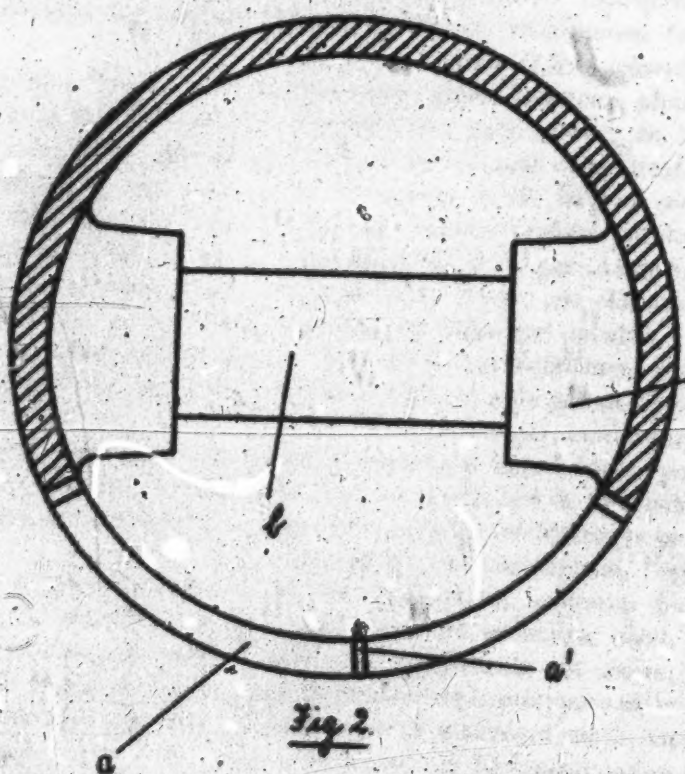
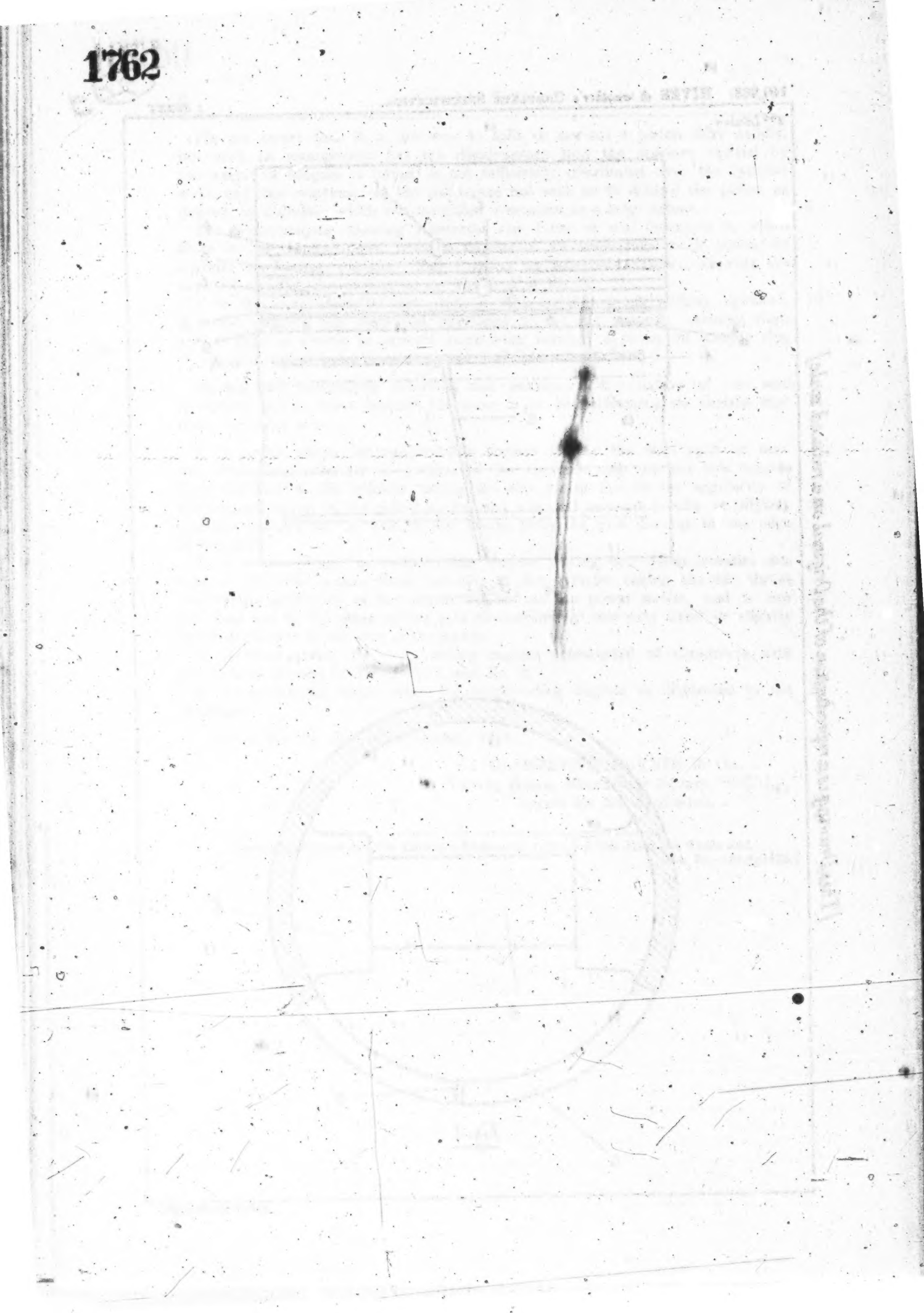


Fig 2



DEFENDANTS' EXHIBIT 4-H(21).
Prior Art Patent.
French Patent No. 468,595 of 1914,
To Chenard & Walcker with Translation.
(Filed January 27, 1934.)

OFFICE NATIONAL DE LA PROPRIETE INDUSTRIELLE.

LIBRARY
FEB 18 1915
U. S. PATENT OFFICE

BREVET D'INVENTION.

N° 468.595

V. — Machines.
8. — Moteurs divers

Piston divisé pour moteurs à explosions.

SOCIÉTÉ ANONYME DES ANCIENS ETABLISSEMENTS CHENARD ET WALCKER résidant en France (Seine).

Demandé le 18 février 1914, à 14h 40m, à Paris.
Délivré le 28 avril 1914. — Publié le 9 juillet 1914.

Cette invention a pour objet un piston pour moteurs à explosions divisé transversalement en deux parties distinctes dont l'une seulement reçoit l'action des gaz au point de vue calorifique, l'autre étant aussi isolée que possible de la précédente pour éviter l'échauffement et, par suite, les grippements.

On sait que les pistons de ce genre ovalisent les cylindres et, pour tâcher d'obvier à cet inconvénient, on leur a donné une section assez complexe que l'on obtient au tour à reproduire pour que, par dilatation, ils s'appliquent exactement contre la paroi du cylindre; d'autre part, dans les moteurs à très grande vitesse, on ne donne pas aux pistons un diamètre tout à fait aussi grand que celui de l'intérieur du cylindre pour éviter les grippements.

De ces différentes dispositions, il résulte que le piston se meut avec des chocs plus ou moins sensibles en produisant, par conséquent, un certain bruit.

Par cette invention, ces inconvénients sont radicalement supprimés et cela, d'une manière simple et pratique, sans nécessiter une main-d'œuvre excessive puisque le piston en question sera simplement usiné au tour ordinaire, comme un piston quelconque.

Au dessin annexé donné seulement à titre démonstratif :

La fig. 1 est une vue en coupe axiale verticale du piston; et

La fig. 2 est une coupe horizontale selon la ligne A-B de la fig. 1.

Comme il a été exposé, le piston comprend deux parties distinctes superposées : la partie *a*, de hauteur relativement faible sur laquelle sont appliqués les segments, et la partie *b*, de longueur beaucoup plus grande que la précédente, pour assurer un bon guidage. Ces deux parties sont complètement séparées par une gorge *c*, de largeur convenable, et elles sont seulement reliées par des cloisons *d*, au nombre de deux par exemple, comme le représente le dessin; ces cloisons ayant une section aussi faible que possible.

Pendant le fonctionnement du moteur, la partie supérieure *a* du piston reçoit seule l'action calorifique des gaz, tandis que la partie *b*, qui est séparée de la précédente par un matelas d'air, ne reçoit que la très faible quantité de chaleur qui lui est transmise par les membranes *d* et, par conséquent, l'échauffement de cette partie *b* est beaucoup moindre que celui d'un piston ordinaire; dans ces conditions, les grippements ont moins de chance de se produire et la pratique a même démontré qu'ils ne se produisaient pas du tout.

On comprend facilement qu'un tel piston peut être parfaitement ajusté dans son cylindre, au moins en ce qui concerne la par-

tie *b* et que, par conséquent, il fonctionne absolument sans aucun bruit. Il présente donc des avantages considérables sur les pistons actuellement employés et ce résultat est obtenu par un moyen extrêmement simple.

Dans le mode d'exécution représenté, les cloisons *d* qui relient les deux parties *a* et *b* du piston sont parallèles; mais il est évident qu'elles pourraient constituer un croisillon ou être disposées de toute autre façon. On peut même remplacer ces cloisons rectilignes par une cloison unique circulaire, si on le désire, mais ayant toujours une section aussi faible que possible pour réduire au minimum la transmission de la chaleur de la partie *a* à la partie *b*.

résumé.

Un piston pour moteurs à explosions divisé en deux parties superposées, de longueur inégale, séparées par un matelas d'air; la partie de moindre développement recevant les segments et étant reliée à l'autre au moyen d'une ou plusieurs cloisons convenablement disposées, mais de section aussi réduite que possible pour éviter la transmission de la chaleur de la partie qui reçoit l'action directe des gaz à l'autre partie.

SOCIÉTÉ ANONYME
DES ANCIENS ÉTABLISSEMENTS CHENARD ET WALCKER.

Par procuration :
Benard et Jullien.

N° 468.595 Société Anonyme Pl. unique
des Anciens Établissements Chenard et Walcker

Fig. 1.

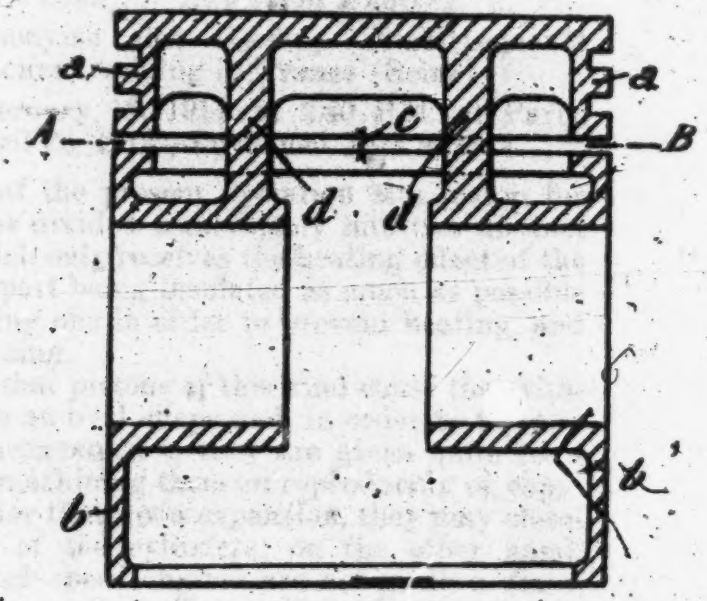
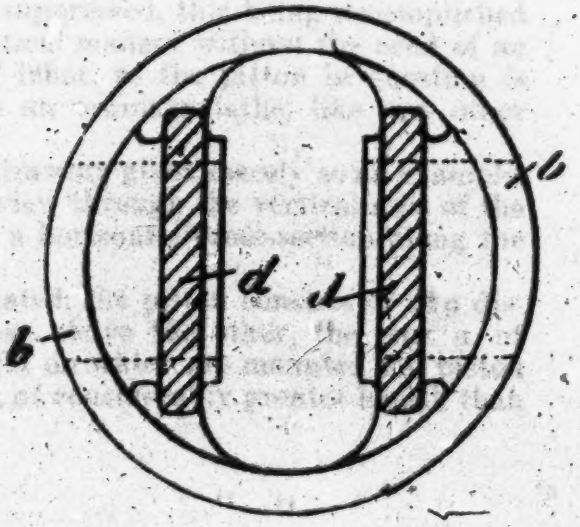


Fig. 2.



FRENCH PATENT NO. 468595

FRENCH REPUBLIC.

National Office of Industrial Property
Patent of Invention No. 468,595

V.—Machines
8.—Miscellaneous engines

Divided Piston for Explosion Engines.

Societe Anonyme des Anciens Etablissements CHENARD & WALCKER, residing in France (Seine)

Applied for February 18, 1914, at 2.40 P.M. at Paris,
Granted April 28, 1914—Published July 9, 1914.

The object of the present invention is a piston for explosion engines divided transversely into two distinct parts, one of which only receives the heating effect of the gases, the other part being insulated as much as possible from the preceding one in order to prevent heating, and consequently, seizing.

It is known that pistons of this kind cause the cylinders to wear into an oval shape and, in order to try and eliminate this inconvenience, they are given quite complex sections by machining them on reproducing or copying lathes, in order that upon expansion, they may closely fit the walls of the cylinders; on the other hand, the pistons in high-speed engines are not given a diameter quite as large as that of the inside of the cylinder, in order to prevent seizing.

The result of these different arrangements is that the piston moves with more or less noticeable shocks, producing as a consequence, a certain amount of noise.

By means of the present invention, these inconveniences are radically suppressed, this being accomplished in a simple and practical manner without the need of an excessive amount of labor, as the piston in question is simply machined on an ordinary lathe, like any other piston.

In the attached drawing given merely as an example, Fig. 1 is a sectional view through the vertical axis of the piston, and Fig. 2 is a horizontal cross-section along the line A-B of Fig. 1.

As previously stated, the piston consists of two distinct parts placed one above the other, the part *a*, of relatively lesser height on which are mounted the piston rings, and the part *b*, of considerably greater length than

the preceding in order to insure good guiding. The two parts are entirely separated by means of the groove *c*, of suitable width, and are merely connected by means of the webs *d*, for example two in number, as shown in the drawing, these webs having as thin a section as possible.

During the operation of the engine, the upper part of the piston alone receives the heating effect of the gases, while the part *b*, which is separated from the former by a cushion of air, receives but a small quantity of heat which is transmitted to it through the sections *d* and consequently, the heating of this part *b* is considerably less than that of an ordinary piston; under these conditions there is less chance of the pistons seizing and practical use has also demonstrated that no seizing at all occurs.

It will be readily realized that such a piston may be perfectly fitted in its cylinder, at least as far as the part *b* is concerned, and that it will consequently work without absolutely any noise. It therefore embodies considerable advantages over the pistons being used at the present time, and this result is secured by extremely simple means.

In the developed form shown herewith, the webs *d* which connect the two parts *a* and *b* of the piston are parallel, although it is evident that they may be of cruciform shape or be arranged in any other manner. The rectilinear webs may even be replaced by a single circular web if desired, but still having as thin a section as possible, in order to reduce to a minimum the transmission of heat from the part *a* to the part *b*.

SUMMARY

A piston for explosion engines divided into two super-posed parts of unequal length, separated by a cushion of air, the less developed portion carrying the piston rings and being connected to the other by means of one or several webs suitably disposed, but of as reduced a cross-section as possible in order to prevent the transmission of heat from the part receiving the direct action of the gases, to the other part.

Societe Anonyme des Anciens Etablissements
Chenard et Walcker

Borame and Julien
by Power of Attorney

OFFICE NATIONAL DE LA PROPRIÉTÉ INDUSTRIELLE.

BREVET D'INVENTION.

LIBRARY U. SEP. 18 1912. S PATENT OFFICE

V. — Machines.
8. — Moteurs divers.

N° 434.147

Tiroir à mouvement alternatif pour moteur sans soupapes.

M. Charles-Émile SEREX résidant en France (Seine).

Demandé le 12 septembre 1911.
Délivré le 17 novembre 1911. — Publié le 25 janvier 1912.

La présente invention a pour objet un tiroir à mouvement alternatif pour moteur sans soupapes, destiné à mettre le cylindre moteur en communication avec l'admission et avec l'échappement aux instants voulus pour assurer la distribution.

Ce tiroir, qui est particulièrement applicable aux moteurs pourvus d'une chemise d'obturation concentrique au piston, est caractérisé essentiellement par :

1° L'application, dans le tiroir, d'un conduit d'échappement disposé transversalement, qui offre au gaz un passage direct, de large section, avec le minimum d'étranglement, de telle sorte que les gaz peuvent s'échapper rapidement sans rencontrer de résistance; ce conduit divise le tiroir en deux parties qui sont réunies par des entretoises latérales de forme appropriée, en contact avec les parois refroidies de la boîte du tiroir;

2° La disposition de l'extrémité du tiroir, qui est fendue et forme segment élastique, de manière que la partie pleine du tiroir soit appuyée contre le conduit d'échappement et l'obture parfaitement pendant l'admission, la compression et l'explosion, dans le but d'éviter les rentrées de gaz d'échappement dans la conduite d'aspiration des cylindres moteurs, où il règne constamment une dépression.

L'invention est représentée, mais à titre d'exemple seulement, dans le dessin annexé, dans lequel :

La fig. 1 est une coupe verticale du nouveau tiroir;

La fig. 2 est une coupe semblable, les organes étant dans une autre position;

La fig. 3 est une coupe par A-A de la fig. 1;

Les fig. 4 et 5 sont des coupes partielles par B-B et C-C de la fig. 1.

Comme on le voit sur ce dessin, le nouveau tiroir est juxtaposé à un cylindre *a*, dans lequel est disposée une chemise d'obturation mobile *b*, avec un système d'étanchéité *c*; le piston moteur se déplace dans cette chemise *b*.

Le tiroir *d* se déplace parallèlement au piston moteur; ce tiroir est logé dans une boîte cylindrique *e*, communiquant avec le cylindre par une lumière *f*.

D'autre part, cette boîte présente une ouverture d'admission *g*, et une autre ouverture *h* débouchant dans un conduit d'échappement *i*.

Dans le tiroir est pratiqué un conduit transversal *j*, destiné à permettre l'échappement; ce conduit divise le tiroir en une partie inférieure *d* et une partie supérieure *d'*, qui sont réunies par des entretoises latérales *k*.

La partie supérieure du tiroir porte une lumière d'admission *l*; le bord supérieur de cette lumière est prolongé par un trait de

sce *m* (fig. 1), et il est fendu en *n*, de manière à former une sorte de segment *o*. Par un moyen approprié, par exemple par martelage, on ouvre le segment comme montré fig. 5, de telle manière que, lorsque le tiroir est engagé dans sa boîte, le segment s'applique élastiquement contre la paroi intérieure de la boîte et pousse le tiroir du côté de la lumière *h*.

Une bielle *p* imprime au tiroir son mouvement alternatif.

La fig. 1 représente le tiroir dans la position d'échappement. Les gaz sortant du cylindre *a* passent par la lumière *f*, le conduit *j*, l'ouverture *h* et, de là, dans le conduit d'échappement *i*, ainsi que l'indiquent les flèches (fig. 3). Comme on s'en rend compte par l'examen de cette fig. 3, les gaz trouvent un passage direct de large section; les entretoises *k* ne provoquent que le minimum d'étranglement. D'autre part, les gaz chauds ne sont en contact qu'avec une faible surface du tiroir.

Le segment *o*, s'appliquant élastiquement contre la paroi de la boîte *e*, appuie le tiroir contre la paroi de la boîte *e*, au-dessus de la lumière d'échappement *h*; il en résulte que les gaz d'échappement ne peuvent passer entre le tiroir et sa boîte et être aspirés par les autres cylindres dans le cas d'un moteur polycylindrique.

Dans la fig. 2, le tiroir occupe la position d'admission. Le mélange carburé entre dans la boîte du tiroir par la tubulure *g*, passe par la lumière *l* du tiroir et la lumière *f* du cylindre et pénètre dans le cylindre.

Le segment *o* s'appliquant contre la paroi de la boîte *e*, la paroi pleine du tiroir est appuyée contre la lumière *h*, de sorte que les gaz d'échappement qui peuvent se trouver dans le conduit *i* ne sont pas aspirés par le cylindre.

Les avantages du nouveau dispositif sont de permettre, dans un moteur sans soupapes comportant un tiroir à mouvement alternatif, de se débarrasser rapidement des gaz d'échappement avec le contact minimum entre ces gaz et les tiroirs, ce qui est important, d'une part, pour éviter l'échauffement du moteur, d'autre part, pour amener un bon remplissage avec les gaz frais pendant la période d'aspiration suivante.

La disposition des entretoises produit le minimum d'étranglement des gaz d'échappement; ces entretoises sont bien refroidies, puisqu'elles sont en contact avec les parois de la boîte cylindrique *e*, qui sont elles-mêmes refroidies.

La nouvelle disposition a encore pour avantage d'empêcher l'aspiration des gaz d'échappement, ce qui a une grande importance pour le rendement du moteur, surtout pendant la marche au ralenti.

Les dispositions ci-dessus ne sont données qu'à titre d'exemple; les formes, dimensions et dispositifs de détail pourront varier dans tous les cas sans changer le principe de l'invention.

RÉSUMÉ.

L'invention a pour objet un tiroir à mouvement alternatif pour moteur sans soupapes, caractérisé essentiellement par :

1° L'application d'un conduit d'échappement disposé transversalement dans le tiroir, offrant au gaz un passage direct de large section, avec le minimum d'étranglement;

2° Une forme d'exécution dans laquelle le corps du tiroir est divisé en deux parties réunies par des entretoises latérales en contact avec les parois refroidies de la boîte du tiroir;

3° La disposition de l'extrémité du tiroir formant segment, de manière que la partie pleine du tiroir soit appuyée contre la partie de sa boîte où est pratiquée la lumière d'échappement et obture parfaitement cette lumière, malgré les différences de diamètre résultant des dilatations, pendant l'admission, la compression et l'explosion, dans le but d'éviter les rentrées de gaz d'échappement dans la conduite d'aspiration.

C.-E. SEREX.

Par procuration :

L. CHABOUTY.

N° 434,147 M. Serex Pl. unique

Fig. 1.

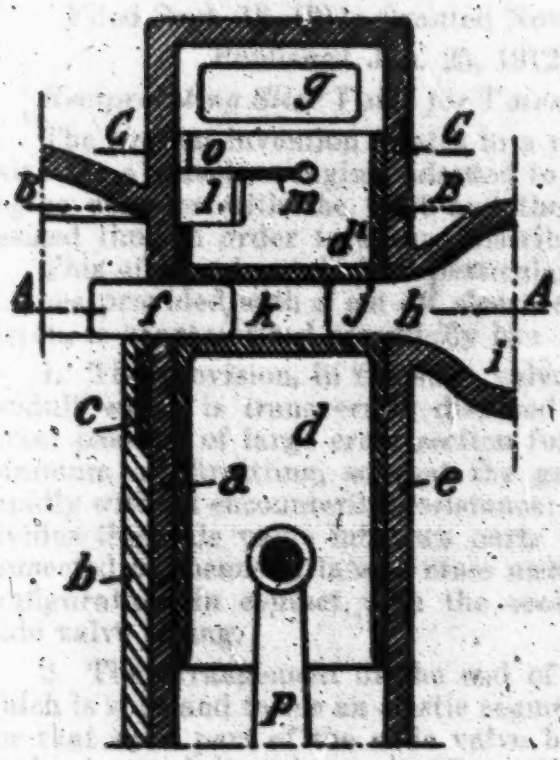


Fig. 2.

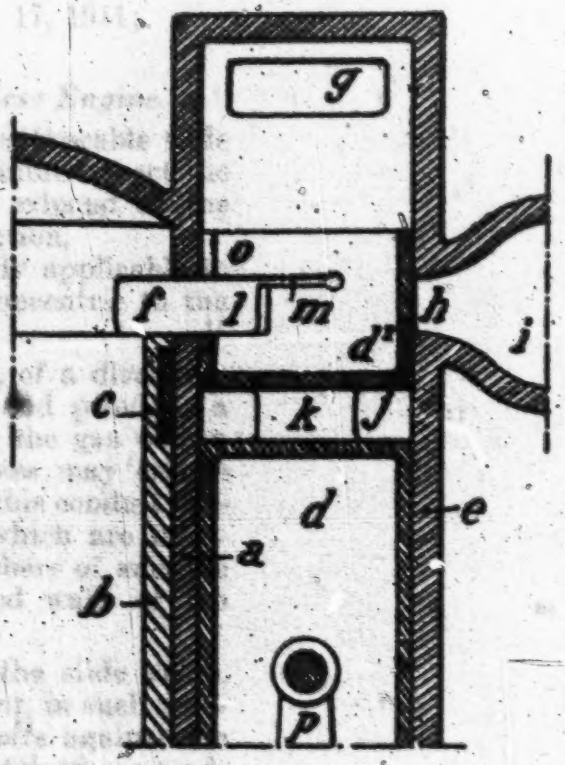


Fig. 3.

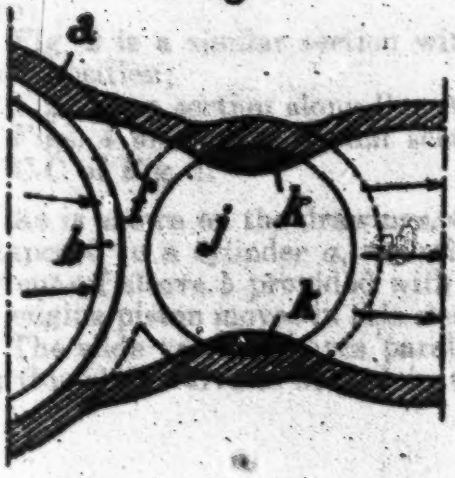


Fig. 4.

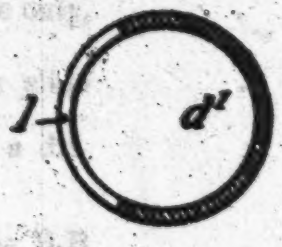
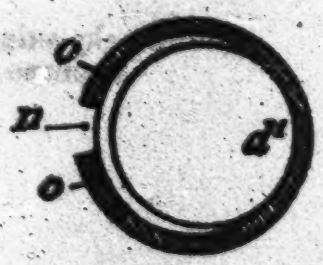


Fig. 5.



1772

FRENCH PATENT NO. 434147

Charles E. Serex, of France. Class V 8

Filed Sept. 12, 1911; Granted Nov. 17, 1911;
Published Jan. 25, 1912.

Reciprocating Slide Valve for Valveless Engine.

The present invention relates to a reciprocable slide valve for a valveless engine, adapted to interconnect the engine cylinder with the inlet and the exhaust at the desired time in order to assure distribution.

This slide valve, which is particularly applicable to engines provided with a cut-off sleeve concentric to the piston, is characterized essentially by:

1. The provision, in the slide valve, of a discharge conduit which is transversely disposed and provides a direct passage of large cross section for the gas with a minimum of throttling, so that the gases may escape rapidly without encountering resistance; this conduit subdivides the slide valve into two parts which are interconnected by means of lateral cross members of suitable configuration, in contact with the cooled walls of the slide valve casing.

2. The arrangement of the end of the slide valve, which is split and forms an elastic segment, in such manner that solid part of the slide valve bears against the discharge conduit and cuts it off completely during admission, compression and explosion, the object being to prevent the entry of exhaust gas into the suction conduit of the engine cylinders, which is under constant reduced pressure.

The invention is illustrated, by way of example only, on the accompanying drawings, wherein:

Fig. 1 is a vertical section through the new slide valve;

Fig. 2 is a similar section with the parts in a different position;

Fig. 3 is a section along line A-A of Fig. 1;

Figs. 4 and 5 are partial sections along lines B-B and C-C of Fig. 1.

As is shown on the drawings, the new slide valve is juxtaposed to a cylinder *a*, wherein is disposed a movable cut-off sleeve *b* provided with reinforcing means *c*; The engine piston moves in this sleeve *b*.

The slide valve *d* moves parallel to the engine piston; this slide valve is housed in a cylindrical casing *e*

which communicates with the cylinder through port hole *f*.

In addition, this casing is provided with an inlet opening *g*, and another opening *h* leading into a discharge conduit *i*.

The slide valve is associated with a transverse conduit *j* which permits exhaust; this conduit subdivides the slide valve into a lower portion *d* and an upper part *d'* connected by lateral cross pieces *k*.

The upper part of the slide valve has an inlet port *l*; the upper edge of this port is extended by means of a saw cut *m* (Fig. 1) and is split at *n* in such manner as to form a sort of segment *o*. By suitable means, for example by hammering, the segment is opened as shown in Fig. 5 so that when the slide valve is in engagement with its casing the segment bears resiliently against the inner wall of the casing and urges the slide valve against opening *h*.

A rod *p* imparts the reciprocatory movement to the slide valve.

Fig. 1 shows the slide valve in the position of exhaust. The gases leaving cylinder *a* pass through opening *f*, opening *h*, and thence into the exhaust conduit *i*, as shown by the arrows in Fig. 3. As is apparent by reference to Fig. 3, the gases are afforded a direct passage of large cross section; ribs *k* offer but little obstruction. In addition, the hot gases are in contact with only a small portion of the surface of the slide valve.

Segment *o*, bearing resiliently against the wall of casing *e*, urges the slide valve against the wall of casing *e* above the exhaust port *h*; consequently, the exhaust gases can not pass between the slide valve and its casing and can not be sucked in by the other cylinders in the case of a multi-cylinder engine.

In Fig. 2, the slide valve is in the position of admission. The carbureted mixture enters into the slide valve casing through port *g*, passes through port *l* of the slide valve and port *f* of the cylinder and thus enters into the cylinder.

Segment *o* bearing against the wall of the casing *e*, the solid wall of the slide valve is urged against port *h*, so that the exhaust gases which may be in conduit *i* are not sucked in by the cylinder.

The advantages of the new construction are that it makes possible, in a valveless engine having a reciprocating slide valve, the rapid discharge of the exhaust gases with a minimum of contact between the gases and the slide valves, which is important, first to avoid heating of the engine, and secondly to permit good charging with fresh gases during the succeeding suction period.

The arrangement of the cross pieces produces a minimum of obstruction to the exhaust gases; these cross pieces are well cooled since they are in contact with the walls of cylindrical casing *e*, which are themselves cooled.

A further advantage of the new arrangement is that it prevents sucking in of the exhaust gases, which is very important for the efficient operation of the engine particularly when moving slowly.

The above embodiments are given merely by way of illustration; the form, dimensions and detail arrangement may be varied without departing from the spirit of the invention.

SUMMARY:

The invention relates to a reciprocable slide valve for a valveless engine and is characterized by:

1. The provision of an exhaust conduit disposed transversely in the slide valve, and providing a direct passage of large cross section for the gases, said passage having a minimum of obstruction;

2. A modification wherein the body of the slide valve is divided into two parts connected together by cross pieces, laterally disposed, and in contact with the cooled walls of the slide valve casing;

3. The arrangement of the end of the slide valve in such manner that the solid part of the slide valve bears against the part of the casing where the exhaust port is located, and cuts off this port completely, despite differences in diameter due to expansion, during admission, compression and explosion, the object being to prevent entry of the exhaust gas into the suction conduit.

OFFICE NATIONAL DE LA PROPRIÉTÉ INDUSTRIELLE.

1re ADDITION
AU BREVET D'INVENTION
N° 434.147

V. — Machines.
S. — Moteurs rotatifs.

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APR 28 1913
PATENT OFFICE

Si 16.362

Tiroir à mouvement alternatif pour moteur à deux compas.

M. Charles-Émile SEREX, résidant en France (Seine).

(Brevet principal pris le 15 septembre 1911.)

Demandée le 21 août 1912.
Délivrée le 28 octobre 1912. — Publiée le 14 janvier 1913.

La présente addition a pour objet divers perfectionnements au tiroir à mouvement alternatif objet du brevet français n° 434.147.

Un perfectionnement vise le moyen d'obtenir une meilleure admission par le tiroir, entre la conduite d'échappement et celle d'admission, afin qu'il ne puisse se faire dans celle-ci des rentrées de gaz d'échappement. Ces rentrées de gaz nuisent en effet à la bonne marche du moteur en calorifi, principalement dans le cas des moteurs polycylindriques, où produisent la marche une dépression importante régnant dans la conduite d'admission. Cette dépression cause l'aspiration entre les parois du tiroir et le tiroir lui-même d'une partie des gaz brûlés, s'il n'y est pas paré.

Le perfectionnement évite aussi, par une disposition bombée des parois du canal d'échappement dans le tiroir, le grippage du tiroir sur la portance des parois, la disposition bombée permettant une certaine élasticité qui rend les dilatations moins dangereuses dans ce canal où passent toujours des gaz chauds.

Le bombage des parois du canal augmente la section de passage à l'endroit des entretoises latérales réunissant les deux faces du canal d'échappement.

Fig. 1 est une coupe verticale du tiroir à la position d'échappement.

Fig. 2 est une coupe verticale du tiroir au moment où l'admission va commencer et où l'échappement vient de finir.

Fig. 3 est une coupe verticale du tiroir à la position d'admission.

Fig. 4 est une coupe partielle de A-B de la fig. 1.

Fig. 5 est une coupe du tiroir à l'endroit où il forme segment (il est supposé vu de son cylindre).

Fig. 6 est une coupe partielle par E-F de la fig. 1.

Dans les fig. 1, 2, 3, on voit que la lumière d'admission f qui, dans la forme principal était ménagée au tiroir, a été supprimée et placée latéralement en dehors de la lumière d'échappement.

La paroi inférieure du tiroir a été fendue par un trait de scie r pour former une espèce de segment commun à la paroi supérieure m et à la paroi inférieure n. Ce segment est maintenu comme celui de la forme principale appliqué à la face contre la paroi des lumières f et h.

Les parois y et z du canal d'échappement ont été bombées pour les rendre plus élastiques et augmenter la section du passage à l'endroit des entretoises k.

Le fonctionnement du tiroir reste le même que celui décrit dans le brevet principal.

Prix du fascicule : 1 franc.

Le résultat obtenu est meilleur, par suite de la nouvelle forme d'exécution du tiroir qui permet de le maintenir appliqué exactement contre les parois du cylindre à l'endroit des lumières.

En outre le vide relatif régnant dans le canal *g* s'ajoute à l'action de l'élasticité du tiroir pour rendre plus parfaite l'obturation lorsque la paroi du tiroir masque l'ouverture *g* c'est-à-dire précisément au moment où on a besoin d'étanchéité.

résumé

La présente addition a pour objet un perfectionnement au tiroir distributeur du brevet principal n° 434.147 caractérisé par :

1° La combinaison des trois lumières débouchant dans le tiroir, la lumière d'échappement dans le prolongement de la lumière venant du cylindre et la lumière d'admission au-dessus de celle d'échappement.

2° L'adjonction de l'élasticité de la partie inférieure du tiroir de la partie supérieure et obtenue par le même moyen.

3° Une plus grande étanchéité entre les orifices d'admission et d'échappement provenant du fait que le tiroir est constamment appliqué contre eux par l'effet de son élasticité créée à ses deux extrémités comme il vient d'être expliqué au 3 *a*.

4° La forme bombée donnée aux fonds du tiroir constituant les parois du canal d'échappement, cette forme ayant pour résultat :

a) D'éviter le grippement du tiroir par dilatation en augmentant l'élasticité des parois du canal qui le traverse, les effets de la dilatation produite par les gaz chauds traversant ledit canal étant absorbés par la partie bombée.

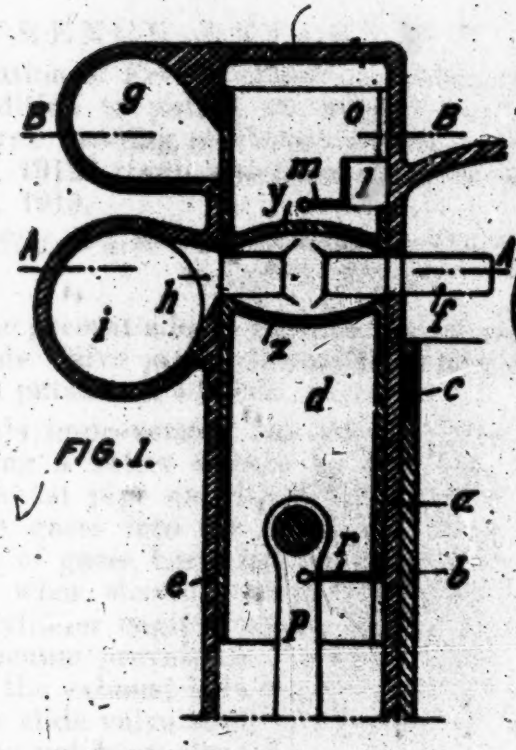
b) D'augmenter la section du canal d'échappement à l'endroit où les dispositifs du brevet principal semblaient le rétrécir.

C.-E. SEREX.

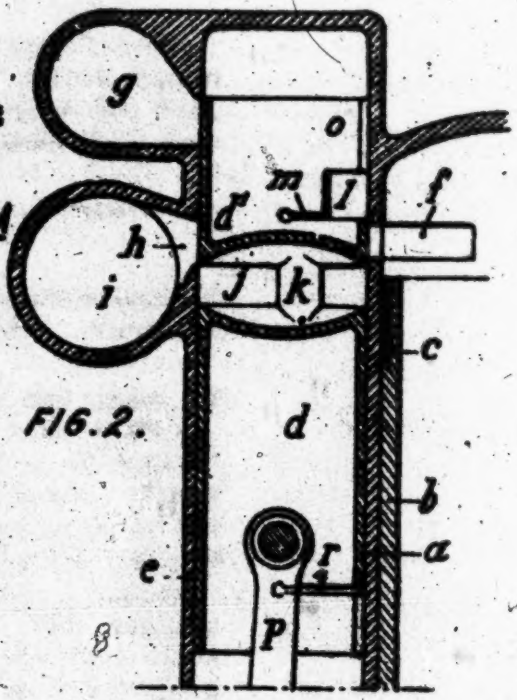
Par procuration :
R. GEISLER-LASSALLE.

Aug. 21 1912.

N° 16.36 2 M. Serez Pl. unique



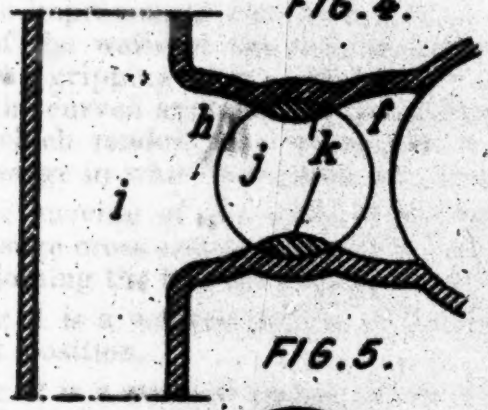
F16.1.



F16.2.

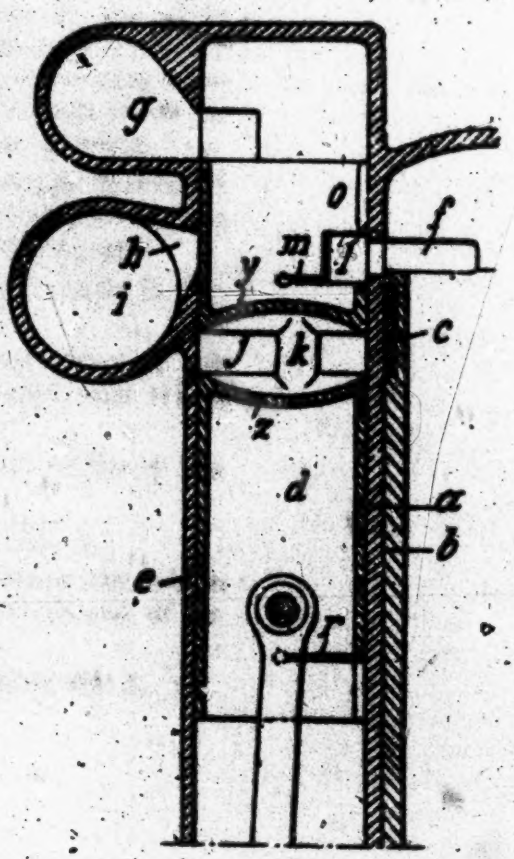
F16.4.

F16.3.



F16.5.

F16.6.



1780

FRENCH PATENT NO. 16362

Translation of French patent no. 16,362, class V-8,—1st. addition to patent no. 434,147—to Charles Emile Serex residing in France (Seine), applied for Aug. 21, 1912, granted October 28, 1912, published Jan. 14, 1913.

Slide Valve with Alternating Movement for Valveless Engine.

The present addition has for object improvements in the slide valve with alternating movement, object of French patent no. 434,147.

This improvement has for its object the means of obtaining a better closure by the slide valve between the exhaust pipe and the intake so that no returns of exhaust gases into the latter will be possible. These returns of gases harm indeed the good operation of the engine when slowing down, principally in the case of multi-cylinder engines where, while running a considerable vacuum prevails in the intake pipe. This vacuum causes the exhaust between the walls of the slide valve and the slide valve itself of a portion of the burnt gases if it has not been cleared.

The improvement also avoids, by a curved arrangement of the walls of the exhaust passage in the slide valve the gripping of the slide on the periphery of the walls, the curved arrangement permitting a certain elasticity which renders any expansions less dangerous in this passage in which hot gases are always passing.

The curving of the walls of the passage increases the passage cross section at the place of the lateral cross pieces joining the two bases of the exhaust passage.

Fig. 1 is a vertical section of the slide valve in the exhaust position.

Fig. 2 is a vertical section of the slide valve at the time when the admission is going to begin and when the exhaust has just finished.

Fig. 3 is a vertical section of the slide valve in the admission position.

Fig. 4 is a partial section of A-A of fig. 1.

Fig. 5 is a section of the slide valve at the place where it forms a segment (it is supposed to be out of its cylinder).

Fig. 6 is a partial section through B-B of fig. 1.

In figs. 1, 2, 3 we see that the admission port g which in the main patent was placed above the slide valve has been moved and placed laterally above the exhaust port.

The lower part of the slide valve has been split by a saw cut r so as to form a sort of segment as in the upper part at m. This segment is hammered like n above so as to keep the slide applied against the wall of the ports g and h.

The walls y and z of the exhaust passage have been curved so as to render them more elastic and to augment the cross section of the passage in the vicinity of the cross pieces k.

The functioning of the slide valve remains the same as that described in the main patent.

The result obtained is better in consequence of the new form of construction of the slide valve which permits keeping it applied exactly against the walls of the cylinder at the place where the ports are located.

Furthermore the relative vacuum prevailing in the passage g is added to the action of the elasticity of the slide valve so as to render more perfect the closure when the wall of the slide valve masks the opening g, that is to say, precisely at the instant when we need tightness.

RESUME

The present addition has for object an improvement in the distributing slide valve of the main patent no. 434,147 characterized by:

1. The combination of the three ports opening into the slide valve, the exhaust port in the extension of the port coming from the cylinder and the intake port above that of the exhaust.

2. The addition of elasticity of the lower part of the slide valve to that of the upper part and obtained by the same means.

3. A greater tightness between the admission and exhaust ports coming from the fact that the slide valve is constantly applied against them because of its elasticity provided at its two ends as has been explained under (2).

4. The curved form given to the bases of the slide valve constituting the walls of the exhaust channel, this form having for result:

a) Avoiding the gripping (jamming) of the slide valve by expansion by increasing the elasticity of the walls of the said passage (channel) which traverses it, the effects of expansion being produced by the hot gases passing through the said channel being absorbed by the curved part.

b) Increasing the cross section of the exhaust passage at the place where the arrangements of the main patent seemed to constrict it.

Tr/CP.

(24)

AUSGEGEBEN DEN 30. OKTOBER 1906.

— № 176988. —

KLASSE 46c. GRUPPE 5.

OTTO LIETZENMAYER IN MÜNCHEN.

Kolben und Zylinder für Verbrennungskraftmaschinen.

DEFENDANTS' EXHIBIT 4-H(24).
Prior Art Patent.
German Patent No. 176,988 of 1906,
To Otto Lietzen Mayer.
(Filed January 27, 1934.)

KAISERLICHES PATENTAMT.

PATENTSCHRIFT

— № 176988 —

KLASSE 46c. GRUPPE 5.

OTTO LIETZENMAYER IN MÜNCHEN.

Kolben und Zylinder für Verbrennungskraftmaschinen.

Patentiert im Deutschen Reiche vom 3. Februar 1906 ab.

Die bei Verbrennungskraftmaschinen bis jetzt in Anwendung kommenden Arbeitskolben, in welchen zugleich das Kreuzkopflager angebracht ist, haben den Übelstand, daß die Schmierung dieses Kreuzkopfgelenkes erschwert und das Nachsehen der Kreuzkopflager während des Betriebes unmöglich ist; außerdem verziehen sich bei großen Durchmessern die Kolben sehr leicht, was auf die Kraftübertragung vom Kolbenboden zum Gelenkbolzen durch die Kolbenseiten zurückzuführen ist. Zum Unterschiede von diesen bekannten Bauarten wird bei dem den Gegenstand vorliegender Erfindung bildenden Kolben der Arbeitsdruck zentral durch die Rippen *a* auf den Gelenkbolzen übertragen, und es wird ferner der führende Teil des Kolbenzylinders bei *b* kreuzkopfartig ausgespart, wodurch die Führung in keiner Weise beeinträchtigt wird und bei ungleicher Materialerwärmung von Zylinder und Kolben kein Klemmen des letzteren auftreten kann. Dabei wird für die Lager der gegabelten Pleuelstange mehr Platz geschaffen, so daß bei diesen Lagern der Flächendruck geringer gehalten werden kann. Wird nun der Zylinder auf der Kurbelseite in ähnlicher Weise wie der Kolben so weit ausgespart, daß er als Geradeführung wirkt und daß in der äußersten Totlage des Kolbens das Gelenk gerade noch zum Vorschein kommt, so ist dadurch eine leichte Schmierung, sowie auch ein Befühlen der Kreuzkopflager mit der Hand während des Betriebes ermöglicht.

Patent-Ansprüche:

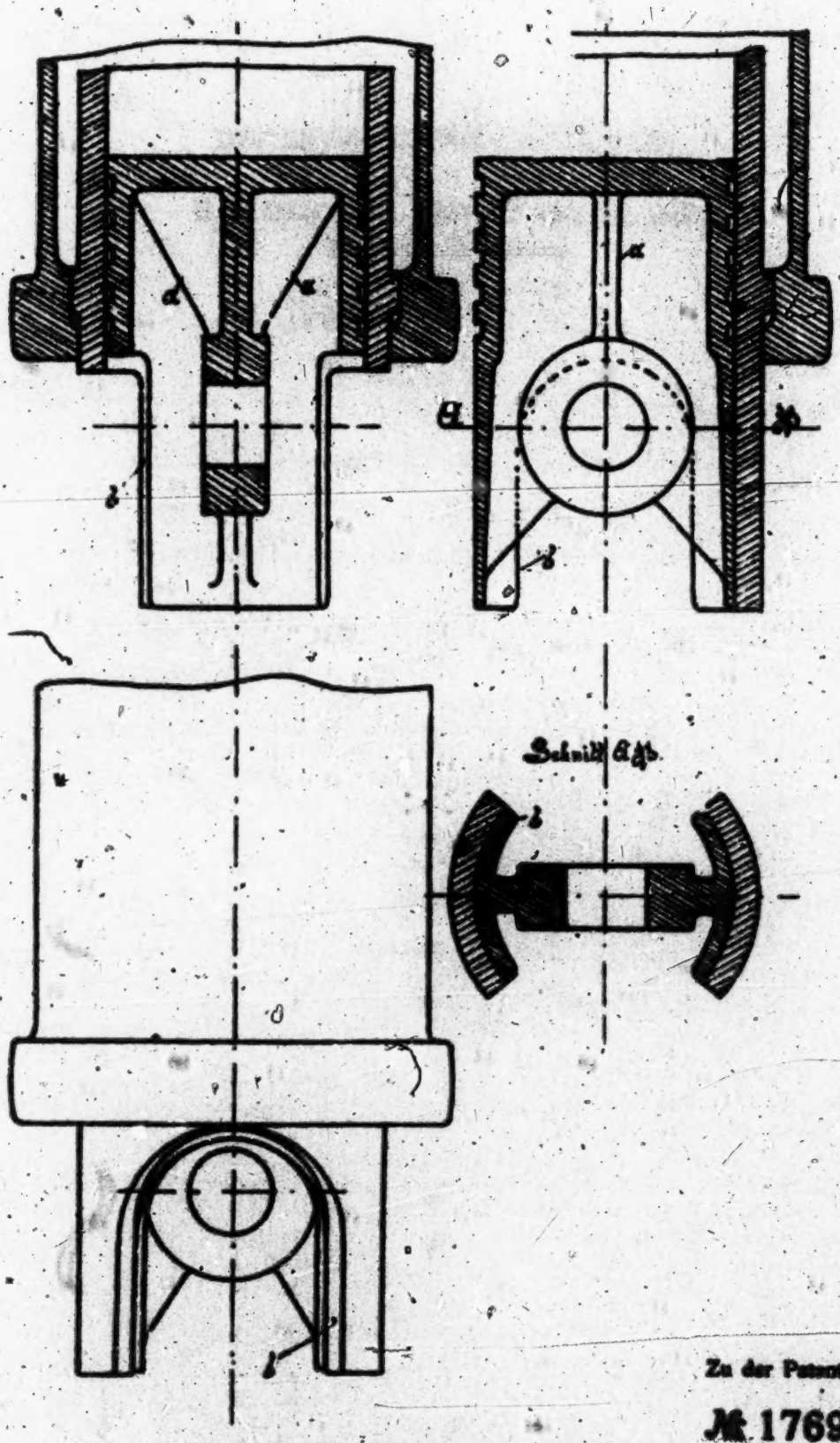
1. Kolben und Zylinder für Verbrennungskraftmaschinen, dadurch gekennzeichnet, daß der führende zylindrische Kolben bis zum Pleuelstangengelenk kreuzkopfartig ausgespart ist, so daß bei einer gleichen Aussparung des Zylinderendes das Gelenk in der äußeren Totlage sichtbar zum Vorschein kommt.

2. Kolben nach Anspruch 1, dadurch gekennzeichnet, daß der Arbeitsdruck vom Kolbenboden auf den Gelenkbolzen durch Rippen übertragen wird, die sich in der Schwingungsebene der Pleuelstange an die zylindrische Kolbenwand, in jeder anderen Richtung nur an den Kolbenboden anschließen.

Hierzu 1 Blatt Zeichnungen.

2. Auflage, ausgegeben am 30. November 1909.

BERLIN. GEDRUCKT IN DER REICHSDRUCKEREI.



Zu der Patentschrift

№ 176988.

PHOTOGR. DRUCK DER REICHSDRUCKEREI

1788

DEFENDANTS' EXHIBIT 4-H(25).

Prior Art Patent.

U. S. Patent No. 1,557,625, Oct. 20, 1925,

To L. M. Spellman.

Piston Construction.

(Filed January 27, 1934.)

1790

Oct. 20, 1925.

1,557,625

L. M. STELLMANN

PISTON CONSTRUCTION

Filed April 18, 1922

2 Sheets-Sheet 1

Fig. 2.

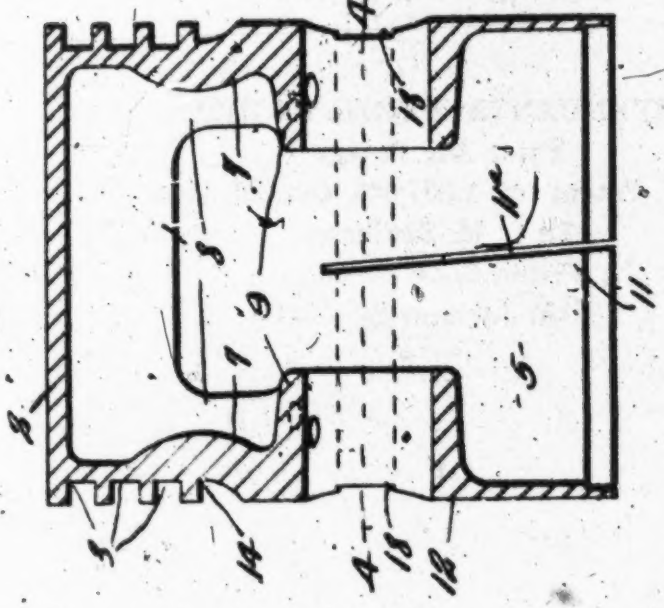
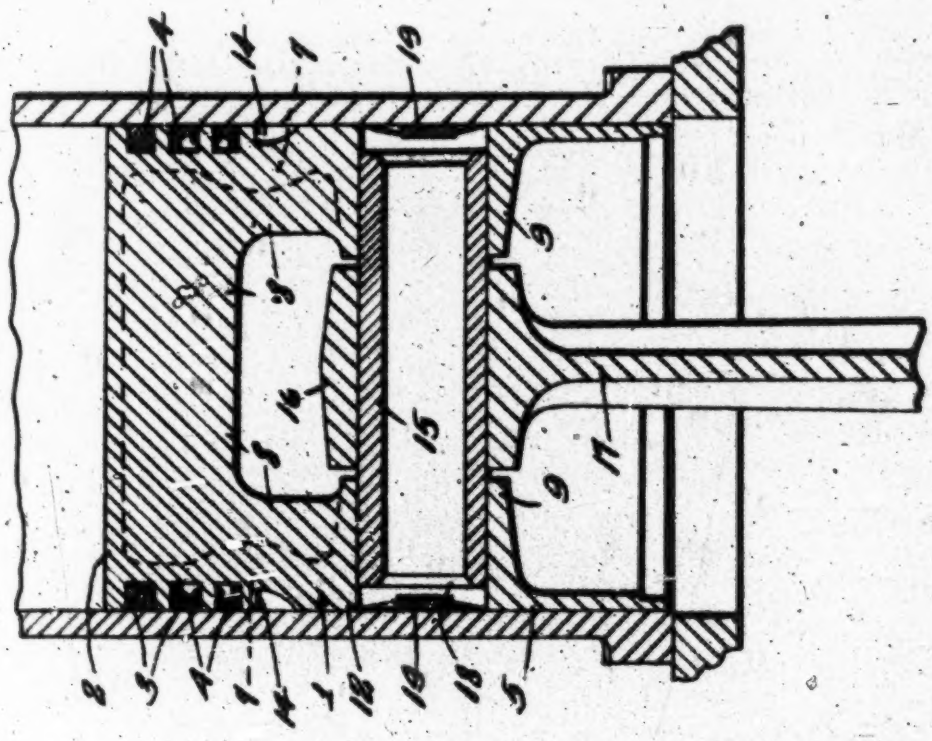


Fig. 1.



Louis M. Stellmann

INVENTOR.

BY

Parsons & Randall

ATTORNEYS.

1791

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Oct. 20, 1925.

1,557,625

L. M. STELLMANN

PISTON CONSTRUCTION

Filed April 18, 1922

2 Sheets-Sheet 2

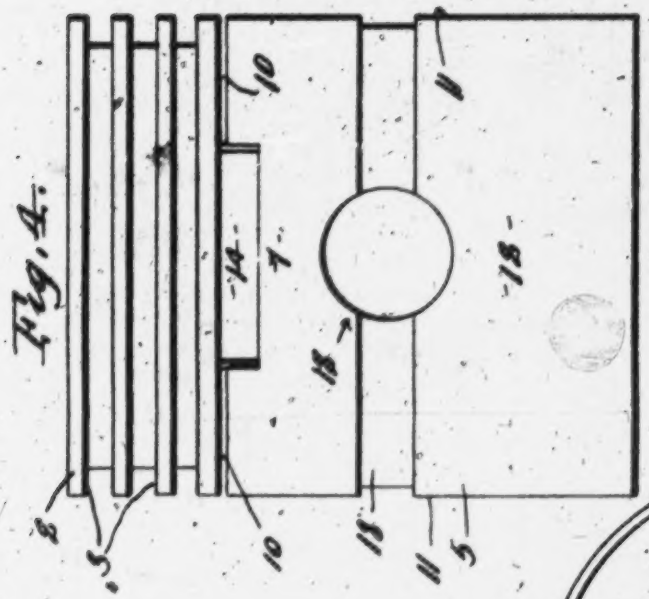


Fig. 4.

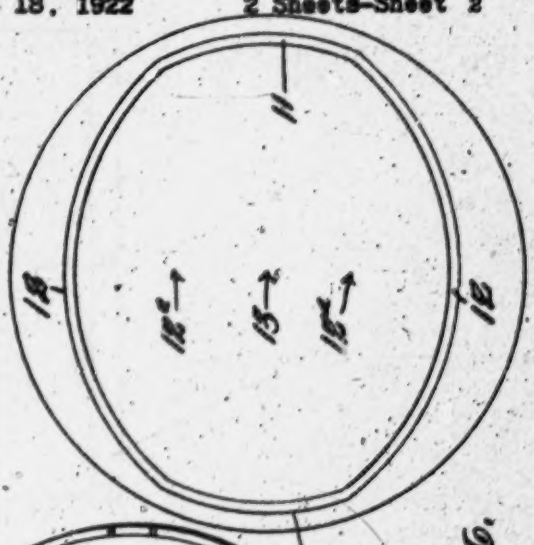


Fig. 6.

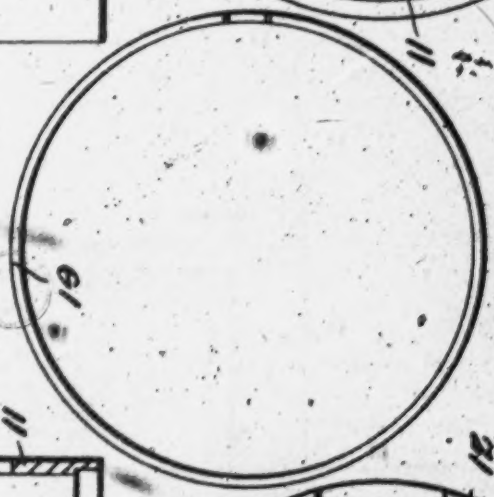


Fig. 7.

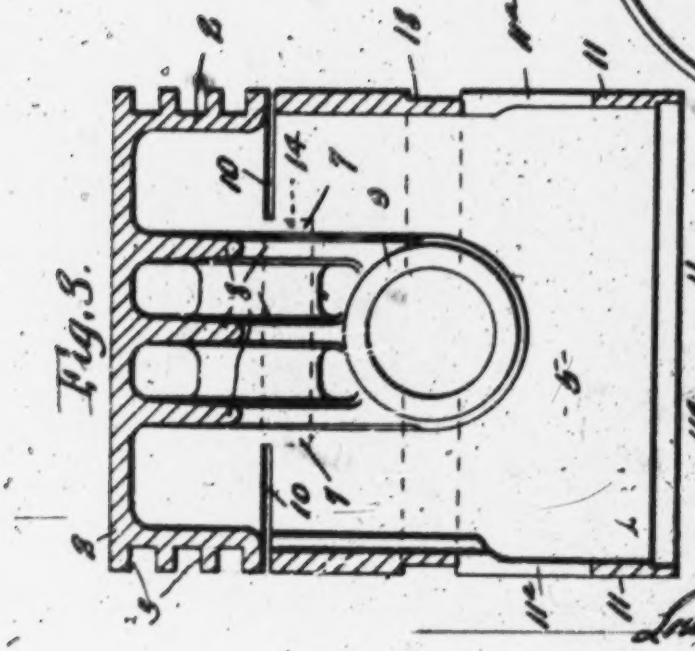


Fig. 8.

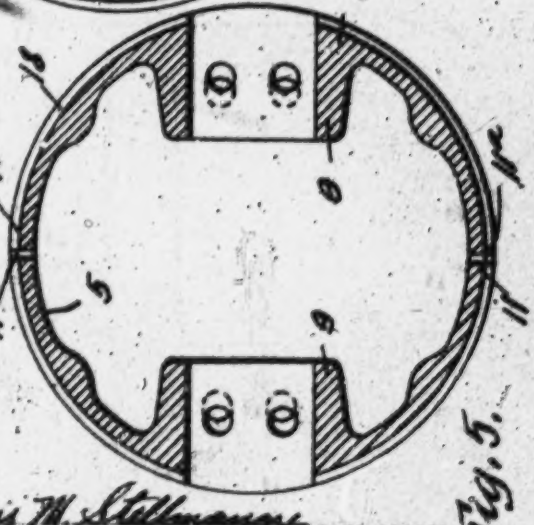


Fig. 5.

Louis M. Stellmann INVENTOR.

BY

Parsons & Bovill ATTORNEYS.

Patented Oct. 20, 1925.

1,557,625

1793

UNITED STATES PATENT OFFICE.

LOUIS M. STELLMANN, OF SYRACUSE, NEW YORK, ASSIGNOR TO H. H. FRANKLIN MANUFACTURING COMPANY, OF SYRACUSE, NEW YORK, A CORPORATION OF NEW YORK.

PISTON CONSTRUCTION.

Application filed April 14, 1923. Serial No. 632,743.

To all whom it may concern:

Be it known that I, LOUIS M. STELLMANN, a citizen of the United States, and a resident of Syracuse, in the county of Onondaga and State of New York, have invented a certain new and useful Piston Construction, of which the following is a specification.

This invention relates to pistons more particularly for internal combustion engines, which pistons are formed of a metal as aluminum alloy, having a greater coefficient of expansion than the cylinder walls which are usually of cast iron; and has for its object an expansible piston having a portion of its skirt or sleeve fitting and conforming to the cylinder at all temperatures of the engines and other portions of its sleeve or skirt normally spaced apart from the cylinder walls and movable or expansible outwardly toward the cylinder walls to conform to the curve thereof, as the piston expands under the influence of the heat generated in the operation of the engine, the expansible portions carrying the wrist pin bosses and constituting approximately two-thirds of the cylinder.

The invention consists in the novel features, and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

Figure 1 is a fragmentary vertical sectional view of this piston, the contiguous portion of the cylinder and also the wrist pin and connecting rod and other parts of the engine being also shown, the connecting rod being broken away at one end.

Figure 2 is a sectional view of the piston similar to that shown in Fig. 1, the cylinder and other parts of the engine being omitted.

Figure 3 is a sectional view of the piston taken at a right angle to Fig. 2.

Figure 4 is an elevation of the piston.

Figure 5 is a transverse sectional view through the piston on line 4—4, Fig. 2.

Figure 6 is a diagrammatic view illustrating the position of the piston in the cylinder, the eccentric or expansible portions or walls of the piston being exaggerated to clearly illustrate the operation or expansion of the piston relatively to the cylinder.

Figure 7 is a detail view of the ring for holding the wrist pins from displacement.

This piston comprises a head portion provided with the usual grooves for the piston rings, and a sleeve, the sleeve having diametrically opposite eccentric expansible portions extending in arcs of greater radius than the normal radius or the radius of diametrically opposite concentric portions of the piston arranged between the expansible portions.

The concentric portions are arranged on the bearing or thrust sides of the piston and are of considerably less width than the eccentric portions, and the pin bosses are carried by the eccentric expansible portions.

1 designates the piston having a head 2 provided with the usual grooves 3 for the piston rings 4.

5 is the sleeve of the piston which is connected to the head by diametrically opposite integral portions at 7 and also by internal brackets or webs 8, the connecting portions 7 and webs 8 being located above the pin bosses 9.

The sleeve is also separated from the head by slots 10 located on diametrically opposite sides thereof on opposite sides of the connecting portions 7 and webs 8.

The sleeve 5 is automatically expansible to fit the cylinder and has concentric portions 11 on diametrically opposite sides thereof which slidably fit the bore of the cylinder and other diametrically opposite eccentric portions 12 between arcs of greater radius than the radius of the concentric portions and the center of the arc of each eccentric portion being located at 13° on the opposite side of the longitudinal axis 13 of the piston from that on which the eccentric portion 12 is located.

In the interest of brevity, the piston thus may be considered to be slightly elliptical in general form in cross section although it is not a true ellipse as its ends are concentric with the axis of the piston and the outline of the piston is not a true ellipse.

The concentric portions 11 are arranged on the bearing or thrust sides of the piston

and each constitutes approximately one-sixth of the sleeve, and the wrist pin bosses 9 project inwardly from the intermediate portions of the eccentric sides of the piston, each of which constitute approximately one-third of the sleeve.

The outer faces of the sleeve are slightly tapered toward the lower end of the piston as indicated in Fig. 5.

Preferably, the concentric portions 11 of the piston are formed with lengthwise slots 11ª opening through the lower end of the piston and extending to a point above the axis of the pin bosses.

The piston is shown as provided with peripheral recesses 14 on diametrically opposite sides thereof in the connecting portion 7 in line with the slots 10. These recesses perform no function in the use of the piston but are present for manufacturing purposes for the purpose of facilitating the cutting of the slots 10 by turning operation.

The slots 10 entirely separate the concentric end portions or walls of the sleeve from the head and partly separate portions of the eccentric walls on opposite sides of the connecting neck 7 from the head.

The wrist pin bosses 9 as before stated, are carried by the eccentric or expansible portions on walls 12 of the sleeve and hence move radially during the expansion of such walls, and the wrist pin 15 is slidably or floatingly mounted in the wrist pin bosses and it is also preferably slidingly or floatingly mounted in the bearing 16 of the connecting rod 17.

In order to prevent the wrist pin from sliding into engagement with the cylinder walls and scoring the cylinder, the piston is provided with means for holding the pin from axial displacement beyond the periphery of the piston.

In the illustrated embodiment of my invention, the sleeve is formed with a circumferential groove 18 which extends across the outer ends of the wrist pin bosses, and a retaining ring 19 is seated in the groove and thus prevents outward movement of the wrist pin.

In case the piston pin becomes broken in use the ring 19 holds the fragment thereof from dropping down into the engine base and damaging other parts of the engine.

In operation, the piston is placed in the cylinder with the concentric portions 11 fitting the bore of the cylinder and holding the piston from slapping. As the piston becomes heated, the eccentric portions 12 thereof expand or bow outwardly toward or into continuations of the arcs of the concentric portions 11 and relieve undue tightness between the concentric portions 11 and the cylinder walls.

This piston construction is particularly advantageous in pistons made of aluminum or aluminum alloy or some metal having a greater coefficient of expansion than the cylinder, in that the piston is made to fit the cylinder at all temperatures of the engine, without relying upon resiliency of the metal. Hence, the liability of a resilient metal taking a permanent set is eliminated as in compressible pistons which sooner or later take a permanent set, and become sloppy.

What I claim is.

1. A piston for internal combustion engines comprising a head and a sleeve, the sleeve being slightly elliptical in general form in cross section, and the sleeve being formed with longitudinal slots arranged in the end walls of the elliptical form, the sleeve having pin bosses extending inwardly from the long walls of the elliptical form along a short diameter of the elliptical form and each of the long walls of the ellipse being approximately one third of the sleeve, substantially as and for the purpose specified.

2. A piston for internal combustion engines comprising a head, and a sleeve, the sleeve having diametrically opposite portions of its wall of equal width concentric with the axis of the piston and other diametrically opposite eccentric expansible portions between the concentric portions having their outer faces of greater radius than the concentric portions and located within continuations of the arcs of the outer faces of the concentric portions, each eccentric portion constituting approximately one-third of the sleeve, the concentric portions being formed with lengthwise slots opening through the lower end of the sleeve, and pin bosses projecting inwardly from the eccentric portions substantially midway between the concentric portions, substantially as and for the purpose specified.

3. A piston for internal combustion engines, comprising a head, and a sleeve, the sleeve having diametrically opposite portions of its wall of equal width concentric with the axis of the piston and other diametrically opposite eccentric expansible portions between the concentric portions, the eccentric portions having their outer faces of greater radius than the concentric portions and located within continuations of the arcs of the outer faces of the concentric portions, each eccentric portion constituting approximately one-third of the sleeve, the concentric portions being formed with lengthwise slots opening through the lower end of the sleeve, and pin bosses projecting inwardly from the eccentric portions substantially midway between the concentric portions, the slots being located in the portion of the sleeve at the end of the ellipse approximately midway between the pin bosses.

4. A piston for internal combustion en-

gines having a head and a sleeve, transverse slots in diametrically opposite sides of the piston separating the opposite side portions of the head from the sleeve, whereby the head is connected to the sleeve between the ends of the slots, the sleeve being slightly elliptical in general form in cross section, the ends of the elliptical form being concentric with the axis of the piston, and wrist pin bosses projecting from the portions of the sleeve joined to the head between the ends of the slots, the axis of said pin bosses extending along the short diameter of the elliptical form, substantially as and for the purpose specified.

5. A piston for internal combustion engines having a head and a sleeve, transverse slots in diametrically opposite sides of the piston separating the opposite side portions of the head from the sleeve, whereby the head is connected to the sleeve between the ends of the slots, the sleeve being slightly elliptical in general form in cross section, the ends of the elliptical form being concentric with the axis of the piston, and wrist pin bosses projecting from the portions of the sleeve joined to the head between the ends of the slots, the axis of said pin bosses extending along the short diameter of the elliptical form, the sleeves being also formed with lengthwise slots midway between the ends of the transverse slots, substantially as and for the purpose set forth.

In testimony whereof, I have hereunto signed my name, at Syracuse, in the county of Onondaga, and State of New York, this _____day of February, 1923.

LOUIS M. STELLMANN.

1796

DEFENDANTS' EXHIBIT 4-H(26).
Prior Art Patent.
U. S. Patent No. 1,842,022, Jan. 19, 1932,
To S. D Hartog.
Piston.
(Filed January 27, 1934.)

1798

Jan. 19, 1932. S. D. HARTOG 1,842,022

PISTON

Filed Feb. 16, 1920

Fig. 1

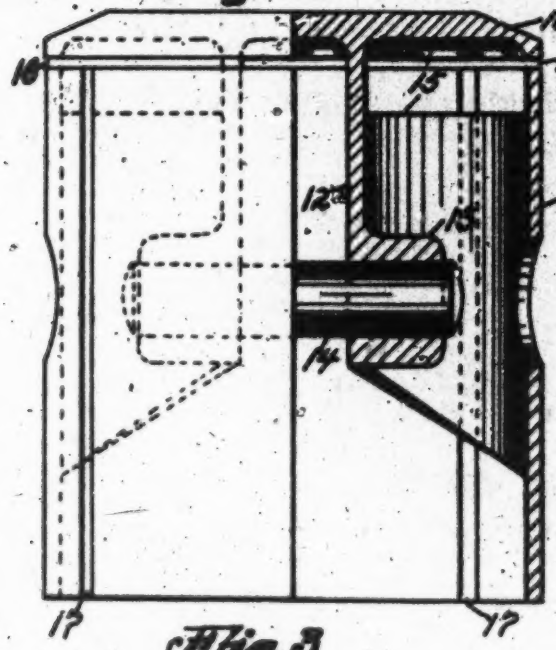


Fig. 2

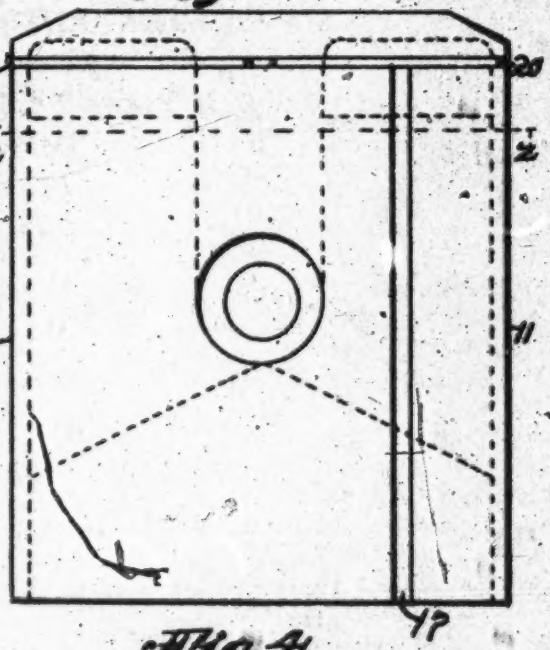


Fig. 3

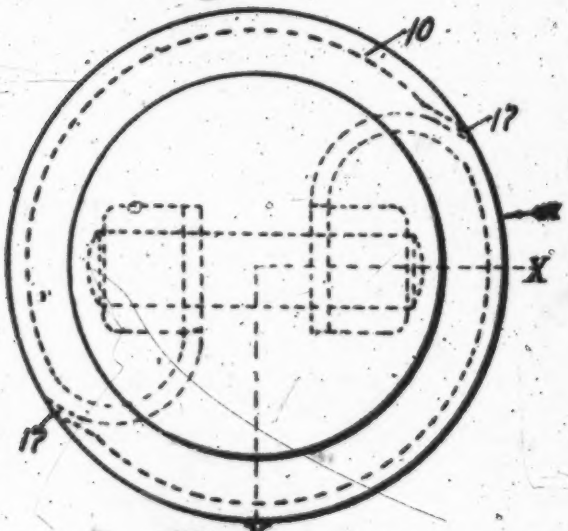


Fig. 4

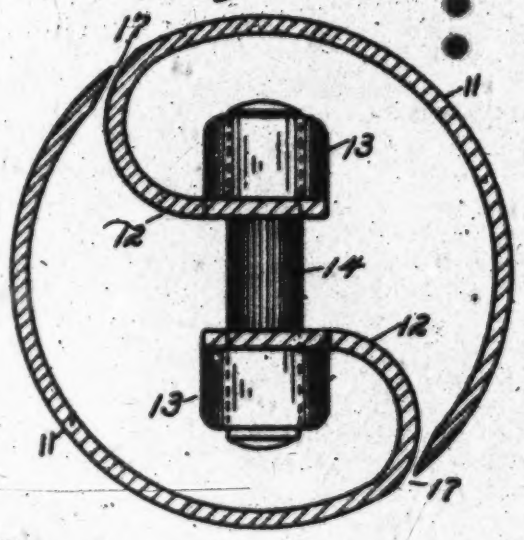


Fig. 5

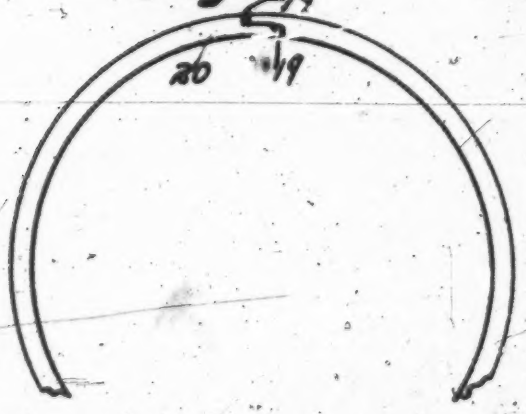
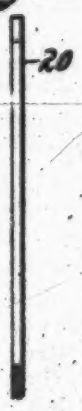


Fig. 6



Inventor
Stephen D. Hartog

Patented Jan. 19, 1932 1,842,022

UNITED STATES PATENT OFFICE

STEPHEN D. HARTOG, OF ST. LOUIS, MISSOURI, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE CLEVELAND TRUST COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

PISTON

Application filed February 16, 1929. Serial No. 340,137.

This invention relates to pistons, more particularly to pistons for use in internal combustion engines.

The piston is the movable member within the cylinder of the engine and in the internal combustion engine the head portion of the piston is subjected to direct contact with the high heat temperature caused by the frequent explosions of the ignited gases. The piston unlike the cylinder is not provided with means for cooling or controlling its temperature and the head portion thereof, quite frequently attains a temperature of 750 to 1000 degrees Fahrenheit. This heat temperature causes the piston to expand and this expansion of the piston is greater than that of the cylinder in which it operates, consequently, the piston must be smaller in diameter than the diameter of the bore of the cylinder to admit of its expansion allowing the piston movable action in the cylinder free from binding, which would otherwise occur were the piston made to a size to fit the cylinder when cold.

The head portion of the piston receives its heat by direct contact, the body portion by transmission, the head portion therefore must be made smaller than that of the body portion.

The piston as thus made would yet be unsuccessful operatively if it were not for the use of split metallic packing rings employed solely to pack the space between the piston and the cylinder and ordinarily positioned in grooves cut in the head section of the piston. The piston as ordinarily made with grooves and packing rings therein lack the requisite features of a more desirable construction in that the looseness of the piston tends to wear the cylinder out of cylindrical truth. The delicate structure of the rings causes them to lose their tension due to the high heat temperature to which they are subjected, consequently, failing in their function to properly pack the cylinder against leakage, causing loss of compression, also permitting the lubricating oil not only to enter the combustion chamber resulting in irregular ignition, but also permitting lubricating oil to secrete beneath the rings between their inner surface and the bottom of the grooves resulting in the formation of carbon therebetween causing a solid mass to form which forces the rings against the cylinder wall and not infrequently results in scoring the cylinder.

The present invention is designed to overcome all of the objections above described and as inhering in the prior art construction, by constructing the piston in such a novel way as will eliminate the objections referred to and to such ends the invention comprises a piston having a head and body free from ring grooves. The head and body united by suitable ribs constructed in a manner providing a yielding capacity. The body of the piston being parted from the head and a slit or series of slits cut through the body and terminating at the parting between the head and the body. Sealing means for the head and body and positioned in the space therebetween.

The object therefore, of the present invention is to construct a piston free from rings and ring grooves, a piston made the reverse of present practice in that it is initially larger in diameter than the diameter of the bore of the cylinder, a piston characterized by the feature of being expansible and contractable automatically under the varying condition to which it is subjected, a piston enabled, by its construction, to fit the cylinder snugly at all times.

For the purpose of enabling others to clearly understand, make, and operate this invention the following description is given supplemented by the accompanying drawings, in which:

Figure 1 is a vertical elevation partly in section as of the line X—X Figure 3.

Figure 2 is a vertical side elevation viewed in the direction indicated by the arrow Figure 3.

Figure 3 is a plan view.

Figure 4 is a plan view in section of Figure 2 as of the line Z—Z Figure 2.

Figure 5 is a fragmentary view in elevation of a member part of this construction.

Figure 6 is a side view of Figure 5.

In the drawings like numerals of reference indicate corresponding parts throughout the several figures. The numeral 10 designates

the head portion of this construction, 11 the body portion, the portions 10 and 11 are united integrally by internal ribs 12 a portion of which has an intersection integrally with the head 10 and the other portion extends radially and has its intersection with the body 11. The ribs 12 have bosses 13 formed thereto which are drilled or bored to receive a pin 14 which connects the piston with the other operable parts of the engine. The ribs 12, are especially constructed to support and unite the head 10 and the body 11 and also to support bosses 13, experience has proven this construction to have an advantage in that of preventing distortion of the body 11, due to the stresses to which a piston is subjected by reason of the angularity of the different positions of the connecting rod while the engine is in operation. The ribs 12, in this case carry the parts connecting the piston with the engine more yieldingly than would be the case were the bosses 13 directly supported by the body 11, resulting in a more smoothly running engine having less vibration. The radially extending portion of the ribs 12, is not connected with the head 10, there being a space 15, between the under side of the head 10, and the upper end of the rib 12, this permits the U shaped cross section of the ribs 12, to have a yielding effect when in operation both in lateral and circular direction, that is to say the body 11, will yield diametrally and circularly when subjected to pressure from the sides.

In the manufacture of this improved construction of piston the head 10, the body 11, with ribs 12, and bosses 13, are cast to form from cast iron or suitable alloy composition metal the hole in the bosses 13, for the connecting pin 14, is cored to approximately the size to which it is finally to be finished the cored hole extending through the body 11, in alignment with the hole in the bosses 13, the space 15, between the under side of the head 10, and the top of the radial portion of the ribs 12, is also cored at the time of casting the entire body. The external surface of the head 10, and the body 11, is subjected to a machining process for the purpose of dressing the head 10, and to size the body 11, so that it will properly fit into the cylinder. At this point a change is made just the reverse of that which is the practice in sizing the conventional type of pistons for instead of machining the body of the piston smaller than the bore of the cylinder into which it is to operate, as is the common practice, my improved piston is machined to a size approximately of .005 of an inch larger than the bore of the cylinder.

When the head 10, and body 11, are thus machined to size the head 10, and the body 11, are then parted from each other at 16, by using a very thin parting tool and cutting through the body 11, adjacent the head 10, a very thin opening 16, is effected parting the head 10, from the body 11.

The next operation is to cut very thin slits 17, adjacent the intersection of the radial ribs 12, with the body 11, cutting through the body 11, and longitudinal of its axis terminating at the parting 16, just beneath the head 10. The resulting consequences of this operation renders the body 11, resilient, that is, the body will yield radially and circularly so that it can be placed tensionally in a cylinder having a bore less in diameter than that to which the piston was sized.

The piston thus made will fit the cylinder very properly but it would not prevent the compression leakage or the escapage of gases through the parting at 16, between the edge of the head 10, and the edge of the body 11. To effect a seal at the parting 16, a thin sheet metal ring 18, Figures 5, and 6, is inserted into this space, this ring is split at 19, with lapping portions 20, one above the other for a distance of about 1/8 of an inch.

The function of the split metal ring 18, is to to seal the opening 16.

From the foregoing description it is clear that this construction fulfills the purpose for which it is intended. The body 11, being resiliently expansible and contractable renders the use of split metal piston rings unnecessary, doing away entirely with grooves cut in the piston for the rings, eliminating this source of danger to the cylinder by reason of the accummulation of carbon therein which tends to build up beneath the rings forcing them against the cylinder walls causing the scoring of the cylinder.

It is finally to be noted that the body portion 11, is turned to a size over its full length to an amount approximately .005 of an inch larger than the bore of the cylinder into which it is to operate. The effect of splitting the body 11, at diametrically opposite position as at 17, and assisted by the U shaped portion of ribs 12, provides the condition for uniform circular expansion and contraction of the body 11, effecting a uniform tensional fit in the cylinder.

It is understood that minor changes may be made in the size, form and shape of this structure without departing from the spirit of this invention within the scope of the appended claims.

Having thus described the invention what I claim and desire to secure by Letters Patent is:

1. A piston having its head and body integrally connected by means of internal yielding ribs, a parting between the head and body, slits cut through said body, sealing means for said head and body, and means provided on said internal ribs adapted to form engaging connection with operable parts for said piston.

2. A piston having internal yielding ribs

integrally connecting the head and body portions of said piston, said head and body portion being parted from each other, sealing means positioned in said parting between the head and body, slits cut through the body portion of said piston providing resiliency for said body and means provided on said internal ribs adapted to form engaging connection with operable parts for said piston.

2. In a piston of the class described, a cup-like head comprising a pressure receiving end and a wall portion, a skirt circumferentially disconnected from the wall portion of the head and divided from end to end, and skirt carriers connecting said skirt to the pressure receiving end, said skirt carriers being disconnected from the wall portion of the head and susceptible of being slightly flexed radially.

4. A piston comprising a head, a skirt having resilient sections separated from said head by a slit extending continuously around the piston, and means for yieldingly connecting said skirt sections with said head.

5. A piston having a skirt at least a portion of which is separated from the head by a slot in which a piston ring is adapted to be mounted, said portion of the skirt being supported from the head by a flexible interior rib member.

In confirmation hereof I hereto attach my signature.

STEPHEN D. HARTOG.

DEFENDANTS' EXHIBIT 4-H(27).
Prior Art Patent.
U. S. Patent No. 1,499,073, June 24, 1924,
To L. H. Pomeroy.
Piston..
(Filed January 27, 1934.)

1804

June 24, 1924. 1,499,073

L. H. POMEROY

PISTON

Filed Sept. 4, 1919

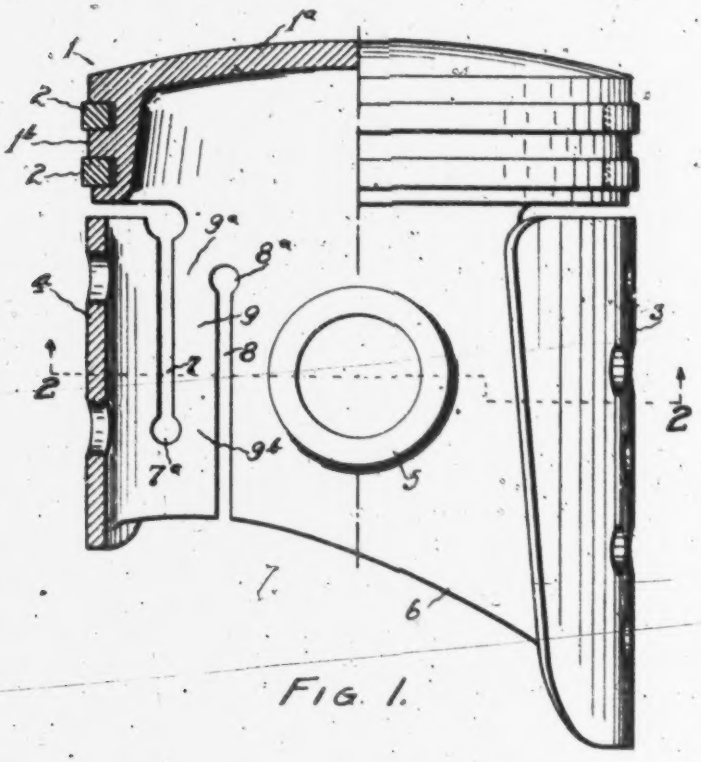


FIG. 1.

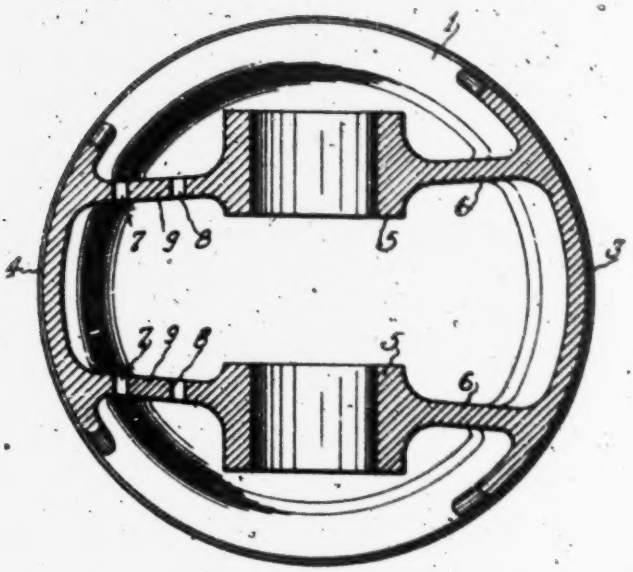


FIG. 2.

INVENTOR,
Laurence Henry Pomeroy
By Ray S. Sehrt
his Attorney

Patented June 24, 1924.

1805
1,499,073

UNITED STATES PATENT OFFICE.

LAURENCE HENRY POMEROY, OF CLEVELAND, OHIO, ASSIGNOR TO THE ALUMINUM COMPANY OF AMERICA, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

PISTON.

Application filed September 4, 1919. Serial No. 321,696.

To all whom it may concern:

Be it known that I, LAURENCE HENRY POMEROY, a subject of the King of Great Britain and Ireland, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Pistons, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates more particularly to pistons adapted for use in internal combustion engines or under conditions in which the piston is subjected to considerable heat.

As is well known, the clearance with which the pistons of internal combustion engines are fitted is determined in a large measure by the difference in thermal expansion of the piston and the cylinder wall. This difference in thermal expansion is due to the fact that the working temperature of the piston is somewhat higher than that of the cylinder wall and, in some cases, to the use of different piston and cylinder materials having different co-efficients of thermal conductivity and expansion. Thus in the case of pistons of aluminum or magnesium alloys working in iron cylinders the co-efficient of expansion of the aluminum or the magnesium being higher than that of iron, it is necessary to give the pistons a larger clearance than is required for iron pistons working in iron cylinders. This larger clearance, with pistons as heretofore constructed, results in piston slap or knock when the engine is running cold at starting and, in fact, whenever the thermal conditions of the cylinder and piston are such that the large clearance required to obviate seizure at high temperatures exists between the piston and cylinder wall.

One object of the present invention is the provision of a piston of aluminum alloy or other light weight metal, that will operate without piston slap.

Another object of the invention is the provision of a piston so constructed that it can be given a small working clearance independent of differences of thermal expansion of the piston and the cylinder wall.

A further object of the invention is the provision of a piston capable of adjusting itself to the cylinder as wear occurs of the piston or cylinder or both.

Another object of the invention is the provision of a piston that will wear evenly from end to end.

Another object of the invention is the attainment of the ends above mentioned in an integrally cast piston.

These and other more or less incidental objects, are attained in the manner set forth in the following description of the preferred form of construction.

In the drawings,

Fig. 1 is a view partly in side elevation and partly in section of a piston embodying the invention.

Fig. 2 is a section on the line 2—2, Fig. 1.

My improvements are applicable to pistons of various forms of construction but in the drawings, for purposes of explanation, I have shown the invention applied to the slipper type of piston shown in United States Letters Patent No. 1,294,833, to H. R. Ricardo.

Referring in detail to the construction illustrated, the piston has a head section 1 comprising a crown 1^a and a side wall 1^b which is formed with grooves to receive suitable packing rings 2, 2. The guide section of the piston comprises diametrically opposite cylinder-engaging slippers 3 and 4, a pair of wrist pin bosses 5, 5 arranged between the slippers, and a pair of webs 6, 6 which join the slippers and bosses together and extend upward and merge with the crown and side wall of the head section of the piston, the entire piston being cast in one. Aside from the rings 2, 2, only the slipper parts 3, 4 are designed to contact with the cylinder wall, the piston differing in this respect from the prior trunk or skirted pistons which have a guide part in the form of a continuous sleeve or skirt that contacts with the cylinder wall on all sides.

In the construction shown the slippers 3 and 4 are made unequal in size, the larger slipper 3 being designed to take the angular thrust or reaction of the connecting rod during the explosion stroke of an internal combustion engine, while the smaller slipper 4 is designed to take the angular thrust during the compression stroke of the engine. The above described features of the construction are characteristic of the Ricardo slipper piston.

My improvements constituting the present invention are effected by forming the piston

so that some part of the guide structure is capable of resiliently yielding at points between the cylinder-engaging surfaces on opposite sides of the wrist pin to compensate for differences in thermal expansion of the piston and cylinder and I prefer to make the guide structure so that it will yield more readily between the wrist pin bosses and the cylinder-engaging surface which takes the thrust during the compression stroke of the piston, than between said bosses and the cylinder-engaging surface which takes the thrust during the explosion stroke. The means, when applied to the slipper type of piston illustrated, that the major yield shall occur between the pin bosses 5 and the cylinder-engaging surface of the slipper 4, and in the construction illustrated I have made provision for a resilient yielding in the webs 6, 6 which permits movement of the slipper 4 toward and from the slipper 3. To secure relative movement of the slipper 4 in parallelism, the web structure is formed to yield in two separated sections, which are preferably adjacent the respective ends of the slipper.

In the construction illustrated this is accomplished by forming each of the webs 6 with two parallel slots 7 and 8, the slot 7 being open at its upper end and closed at its lower end, while the slot 8 is closed at its upper end and open at its lower end. The slots 7 and 8 terminate at their closed ends with enlarged cylindrical aperatures 7^a and 8^a, respectively. Thus it will be seen that the slipper 4 is supported by elongated strips or sections 9 of the webs 6, and each of the sections 9 has reduced and weakened cross sections at 9^a and 9^b, so that any yielding of the web structure is localized at these points 9^a and 9^b.

My improved form of construction can be applied to pistons cast of any suitable metal but it is especially useful in connection with pistons of aluminum alloy or other light metals having high coefficients of thermal expansion in comparison with iron as it makes it possible to fit such pistons with as small a clearance as is possible with iron pistons of prior forms of construction. Iron pistons of internal combustion engines fitted with a clearance of 0.00075 inch per inch of piston diameter are found to operate with substantial freedom from piston slap, and pistons of aluminum alloy made in accordance with my invention can readily be operated with similar clearances. Indeed a still smaller clearance is made possible by my invention.

In the operation of aluminum pistons of my improved form of construction, asuming a cold working clearance of 0.00075 inch per inch of piston diameter, or less, to insure freedom from piston slap when starting, as the engine heats up the excess expansion of the piston as compared with the surrounding cylinder wall of iron will reduce this clearance; but as the clearance approaches zero the construction of the piston webs permits them to yield so as to compensate for the excess expansion of the guide section of the piston and all danger of the seizing of the piston is obviated. When the engine is stopped and the parts again cool down the resilience of the web structure causes it to return to normal form and a suitable small clearance between the piston guide and the cylinder wall is maintained. It will, of course, be understood that the piston head proper is given a smaller diameter than the guide and does not function as a guide. As has been explained the yielding of the web structure occurs at the points 9^a and 9^b adjacent to the upper and lower parts of the slipper 4 so that the slipper 4 is maintained in parallelism with the axis of the cylinder. This insures uniform contact and wear throughout the full length of the slippers. As only a relatively light thrust, incident to the compression of the combustible charge in the engine cylinder, is applied to the smaller slipper 4, the resilient web structure is able to sustain the stresses to which it is subjected, it being possible, of course, to make the guide structure between the wrist pin bosses and the cylinder-engaging surface of the slipper 3 adequately strong to sustain the heavy thrust due to the explosion of the engine charge. This is an important feature of my invention since in most, if not all, cases it is found that a construction that is capable of yielding sufficiently to adequately compensate for differences of expansion, will fail if subjected to the angular thrust of the connecting rod in the working or explosion stroke of the piston.

It is to be understood that the dimensions of the yieldable web sections, as at 9^a and 9^b, will be determined by the diameter of the piston and other factors such as the compression pressure and the maximum engine speed, the requirements being that the web sections 9^a and 9^b yield sufficiently to prevent seizing under the pressure set up between the cylinder wall and the piston due to thermal expansion, but do not yield too much under the thrust due to compression and inertia, and that they yield, whether under said expansion pressure or under the thrust due to compression and inertia, in a manner to maintain the slipper 4 parallel to the piston axis.

It will be seen that the amount of yielding in the piston webs will be determined, for the most part, by the cold working clearance of the piston. By making this clearance sufficiently small the clearance will be rendered nil when the parts heat up in operation and a resilient pressure of the slippers against the cylinder wall will be secured.

Under these conditions the resiliency of the piston web structure will insure the maintenance of close working contacts between the slippers and the cylinder wall as wear of these parts occurs and, as above noted, the movement of the slipper 4 parallel to the piston axis will insure a uniform contact and wear of the parts throughout the full lengths of the slippers. In other words, my resiliently yieldable piston structure, by compensating for excess expansion of the piston, secures an automatic adjustment of the piston to the cylinder as wear occurs.

My improvements, while applicable in their broader aspects to other types of pistons, are especially applicable to the slipper type of piston illustrated and it will be seen that this is due, in part at least, to the fact that the yieldable web parts have no contact with the cylinder wall and thus are free, in so far as the cylinder is concerned, to accommodate themselves to the movement of those parts which do engage the cylinder.

It is obvious that my invention can be embodied in various forms of construction and it is to be understood that it is not limited to the particular construction illustrated in the drawing except as specified in the following claims.

What I claim is:

1. An integrally cast piston comprising a head, diametrically opposite guide slippers, a pair of wrist pin bosses between the slippers and a pair of webs joining the head, slippers and bosses together, said webs being formed at points between the bosses and one of the slippers so as to resiliently yield and permit movement of said slipper toward and from the other slipper.

2. An integrally cast piston comprising a head, diametrically opposite guide slippers, a pair of wrist pin bosses between the slippers and a pair of webs joining the head, slippers and bosses together, said webs being formed at points between the bosses and one of the slippers so as to resiliently yield and permit movement of said slipper in parallelism toward and from the other slipper.

3. An integrally cast piston comprising a head, diametrically opposite guide slippers, a pair of wrist pin bosses between the slippers and a pair of webs joining the head, slippers and bosses together, said webs being formed between the bosses and one of the slippers each with a pair of parallel slots of which one is open at its end adjacent the piston head and the other is open at its end away from said head.

4. A piston comprising a head and a guide structure connected thereto having wrist pin bosses and cylinder-engaging surfaces on opposite sides of the bosses, the guide structure being adapted to resiliently yield to a greater extent between the pin bosses and one of said cylinder-engaging surfaces than between the said pin bosses and the other cylinder-engaging surface.

5. A piston having a head and a guide structure connected thereto, said guide structure comprising diametrically opposite parts having cylinder-engaging surfaces, wrist pin bosses, between said opposite parts, and means for joining said bosses and cylinder-engaging parts, said joining means being arranged not to engage the cylinder and the guide structure being adapted to resiliently yield to a greater extent between the pin bosses and one of said cylinder-engaging surfaces than between the said pin bosses and the other cylinder-engaging surface.

6. A piston having a head and a guide structure connected thereto, said guide structure comprising diametrically opposite slippers having cylinder-engaging surfaces, wrist pin bosses between the slippers and means joining said bosses and slippers together, the guide structure being adapted to resiliently yield to a greater extent at points between the pin bosses and the cylinder-engaging surfaces of one slipper than between the said pin bosses and the cylinder-engaging surfaces of the other slipper.

7. A piston having a head and a guide structure connected thereto which comprises diametrically opposite cylinder-engaging parts, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable to a greater extent on one side of the wrist pin bosses than on the other side thereof.

8. A piston having a head and a guide structure connected thereto which comprises diametrically opposite slippers, wrist pin bosses between the slippers and means joining said bosses and slippers together, the said joining means being resiliently yieldable to a greater extent on one side of the wrist pin bosses than on the other side thereof.

9. A piston as claimed in claim 4 characterized by being integrally cast.

10. A piston as claimed in claim 5 characterized by being integrally cast.

11. A piston as claimed in claim 6 characterized by being integrally cast.

12. A piston as claimed in claim 7 characterized by being integrally cast.

13. A piston as claimed in claim 8 characterized by being integrally cast.

In testimony whereof, I hereunto affix my signature.

LAURENCE HENRY POMEROY.

Vol. IV

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Supreme Court of the United States

OCTOBER TERM, 1938

No. 3

THE SCHRIBER-SCHROTH COMPANY,
PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 4

THE ABERDEEN MOTOR SUPPLY COMPANY,
PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 5

THE F. E. ROWE SALES COMPANY, PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

ON WRITS OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT.

PETITION FOR CERTIORARI FILED JANUARY 7, 1939.

CERTIORARI GRANTED MAY 31, 1939.

United States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants,* vs. THE SCHREIBER-SCHROTH COMPANY, *Defendant-Appellee.*	No. 4045. EQUITY.
THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants,* vs. THE ABERDEEN MOTOR SUPPLY COMPANY, *Defendant-Appellee.*	No. 4046. EQUITY.
THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants,* vs. THE F. E. ROWE SALES COMPANY, *Defendant-Appellee.*	No. 4047. EQUITY.

APPEALS FROM
THE DISTRICT COURT OF THE UNITED STATES,
FOR THE NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION.

TRANSCRIPT OF RECORD

VOLUME IV.

Balance of Defendants' Exhibits and Notes Re Cases Nos. 4046 and 4047.

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United States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,
vs.
THE SCHRIBER-SCHROTH COMPANY,
Defendant-Appellee.

No. 4045.
EQUITY.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,
vs.
THE ABERDEEN MOTOR SUPPLY COMPANY,
Defendant-Appellee.

No. 4046.
EQUITY.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs-Appellants,
vs.
THE F. E. ROWE SALES COMPANY,
Defendant-Appellee.

No. 4047.
EQUITY.

APPEALS FROM
THE DISTRICT COURT OF THE UNITED STATES,
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EASTERN DIVISION.

TRANSCRIPT OF RECORD

VOLUME IV.

Balance of Defendants' Exhibits and Notes Re Cases Nos. 4045 and 4047.

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2.	U. S. Patent No. 1,815,733, July 21, 1931, to E. J. Gulick (Patent in Suit).....	51	1283
3.	U. S. Patent No. 1,763,523, June 10, 1930, to F. Jardine (Patent in Suit).....	51	1291
4.	U. S. Patent No. 1,655,968, Jan. 10, 1928, to H. E. Maynard (Patent in Suit)	51	1299
5.	U. S. Patent No. 1,256,265, Feb. 12, 1918, to V. E. Schmiedeknecht (Patent in Suit)	51	1305
6.	U. S. Patent No. 1,402,309, Jan. 3, 1922, to L. P. Moores (Patent in Suit).....	51	1309

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29.	Sketch by Randall of Gulick Piston	617	1359
30.	Series of Blueprints of Gulick Motor	617	W
31.	Cross Section Drawing Gulick Sleeve Valve Motor	617	1361
32.	Detail of Piston of Preceding Exhibit	617	1363
33.	Sketch, Gulick Piston (P.X. 62)	770	W
34.	Ebbs Physical Piston (Marked for identification, 565)	...	W
35-A.	Sketch by Winchester of Gulick Piston (Marked for identification, 638)	...	1365
35-B.	Sketch by Winchester of Gulick Piston (Marked for identification, 638)	...	1367
35-C.	Sketch by Winchester of Gulick Piston (Marked for identification, 638)	...	1369
35-D.	Sketch by Winchester of Gulick Piston (Marked for identification, 638)	...	1371
35-E.	Sketch by Winchester of Gulick Piston (Marked for identification, 638)	...	1373
36.	Gulick 1911 Sketch (Identified, 702)	780	1375
37.	Gulick Written Description (Identified, 702)	780	1377

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38a.	Supplemental Contract between The Cleveland Trust Co. and Aluminum Co. of America, dated April 26, 1924.....	282	1378
38b.	License Agreement between The Cleveland Trust Co. and Aluminum Co. of America	282	1381
	Exhibit A to License Agreement (Agreement between The Cleveland Trust Co. and Nordyke & Marmon Co., dated April 23, 1920).....	282	1393
38c.	License Agreement between Walker M. Levett Co., W. M. Levett Corp., Walker M. Levett and The Cleveland Trust Co., dated April 11, 1924.....	282	1397
38d.	License Agreement between The National Piston Co., Gustave E. Franquist, James E. Diamond and The Cleveland Trust Co., dated April 11, 1924.....	282	1403
38e.	License Agreement between Kant-Skore Piston Co. and The Cleveland Trust Co., dated April 11, 1924.....	282	1408
39a.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated Sept. 19, 1927	282	1412
39b.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated Oct. 12, 1927	283	1413
39c.	License Agreement between The Cleveland Trust Co. and Bohn Aluminum & Brass Corp., dated Sept. 15, 1927, with Lists A and B attached.....	283	1414
	List A	283	1426
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39e.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated April 26, 1928	283	1429
39f.	License Agreement between The Cleveland Trust Co. and Bohn Aluminum & Brass Corp., dated April 25, 1928	283	1430
39g.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated Dec. 24, 1929	283	1434
40.	Agreement between Bohn Aluminum & Brass Corporation and The Cleveland Trust Co., dated Oct. 12, 1927 under Schmiedeknecht Patent No. 1,256,265	287	1435
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42a.	Franklin Weekly Engineering Report for the Week Ending Oct. 5, 1918	658, 663	1438
42b.	Franklin Weekly Engineering Report for the Week Ending July 20, 1918	658, 663	1439
42c.	Franklin Weekly Engineering Report for the Week Ending May 3, 1919	658, 663	1440
43.	Photostat of Drawing P-2912	663	W
44.	Letter to E. C. Long from Franklin Mfg. Co., dated May 9, 1918	663	1445
45.	Letter to E. C. Long from Franklin Automobile Co., dated April 17, 1918	663	1446
44.*	Gulick Sketch Made in Court of First Sketch of 1911 (Identified, 701)	730	1447
45.*	Blueprint of Standard Excelsior Motor (Identified, 704)	730	1449
46.	Blueprint P-2912	693	1451
47.	Piston Used by Excelsior Motor (Identified, 705)	730	W
48.	Reproduction of Piston as Used by Excelsior (Identified, 705)	730	W
49.	Excelsior Motorcycle Piston (Identified, 709)	730	W

Nos.		Offered Vol. II	Printed Vol. III
50.	Blueprint of Excelsior Motorcycle Piston (Identified, 709)	730	1453
51.	Gulick Sketch Made in Court of Piston made by Casting of Rockhoff	716	1455
52.	Letter, Packard Motor Car Co. to E. J. Gulick, dated Mar. 27, 1916	721	1457
53.	Letter, E. J. Gulick to Packard Motor Car Co., dated April 1, 1916	722	1459
54.	Letter, E. J. Gulick to Packard Motor Car Co., dated Dec. 4, 1916	722	1460
55.	Letter, Packard Motor Car Co. to E. J. Gulick, dated Feb. 28, 1917	722	1461
56.	Letter, E. J. Gulick to Packard Motor Car Co., dated May 18, 1917	722	1462
57.	Letter, E. J. Gulick to Packard Motor Car Co., dated Mar. 26, 1917	724	1463
58.	Core-box Used by Excelsior Motor & Mfg. Co.	724	W
59.	Pattern Used by Excelsior Motor & Mfg. Co.	724	W
60.	Picture of Renault Type Car Driven by Gulick in 1911	727	1465
61.	Letter in re Above, dated Dec. 1, 1927, in re Loss of Original	727	W
62.	Gulick Exhibit No. 11 in Interferences 49,569, 49,570 and 49,571	770	1467
63.	Letter, Ray Stewart Gehr to E. J. Gulick, dated Aug. 22, 1923 (Identified, 811)	...	1469
64.	Letter, E. J. Gulick to Ray Stewart Gehr, dated Aug. 23, 1923 (Identified, 811)	...	1471
65.	Gulick Deposition on Interferences 49,569, 49,570 and 49,571, pages 40 to 103, inclusive	827	1472
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	Re-Cross Examination		1526
	Re-Direct Examination		1530
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66.	Patent Office List of Applications of Elmer C. Long filed in Patent Office.....	830	1532
67.	Record of Long Interference No. 45,569	831	W
67-A.	Record of Interference of Exhibit No. 65 (pp. 104 to 281) not received	831	W
67-B.	Opinion of Examiner in Interference No. 49,569	832	1533
67-C.	Opinion of Board in Interference No. 49,569	832	1538
67D.	Opinion of the Court of Patent Appeals	832	W
68.	Record of Interference No. 49,575	...	W
68-A.	Opinion of Examiner in Interference No. 49,575	832	1541
68-B.	Opinion of Board in No. 49,575	832	1544
68-C.	Opinion of Court of Appeals of District of Columbia in Interference No. 49,575.	832	1546
69.	Record of Interference No. 49,570	....	W
69-A(1).	Opinion of Law Examiner in Interference No. 49,570	832	1548
69-A(2).	Opinion of Examiner of Interferences in Interference No. 49,570	832	1551
69-B(1).	Petition for Rehearing in Interference No. 49,570	832	1554
69-B(2).	Opinion of Board in Interference No. 49,570	832	1556
69-B(3).	Opinion of the Board of Appeals in Interference No. 49,570	832	1558

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69-C.	Opinion of the Court of Customs and Patent Appeals in Interference No. 49,570	832	1562
70-A.	Opinion of the Examiner in Interference No. 49,571	832	1565
70-B.	Opinion of the Board in Interference No. 49,571	832	1570
71-A.	Head Portion of Piston of Franquist Type	944	W
71-B.	Skirt Portion of Piston of Franquist Type	944	W
72-A.	Head Portion of Piston of Maynard Type	945	W
72-B.	Skirt Portion of Piston of Maynard Type	945	W
73.	Ricardo Type Piston	951	W
74.	Drawing Showing Dimensions of Defendants' Exhibit Monckmeier 3-V	952	1573
75.	Drawing Showing Dimensions of Defendants' Exhibit Monckmeier 3-W	952	1575
76.	Ford 1933 Piston	1048	W
77.	Agreement, Aug. 4, 1917, between Mocers-Pitts, Cleveland Trust-Sawyer, Sterling-Alexander (Formal Offer not included in Narrative)	...	W
78.	Ditto of March 7, 1922 (Formal Offer not included in Narrative)	...	W
79.	Drawing of Iron Piston Used by Dorris Motor	1062	W
80.	Sterling Piston with Steel Strut	1063	W
81.	Docket Entry, Gulick vs. Packard Motor Car Co.	1090	W
82.	Ampler Receivership Statement of Feb. 6, 1914	1090	W
83.	Ampler Receivership Journal Entry	1090	W
84.	Ruling of Examiner in Abandoned Application of Ray R. Day for Patent	1091	1577

Nos.		Offered Vol. II	Printed Vol. III
85.	Certified Copy of the Drawings of the Abandoned Application of Ray E. Day, filed January 10, 1923, Serial No. 611,698	1091	1579
86.	Patent Office Interference	...	W

DEFENDANTS' EXHIBITS.

(*W* in last column signifies *Withdrawn or Omitted*)

Nos.		Offered Vol. I	Printed Vol. III
A.	Drawing produced by Venne[illegible] of Long 1916 Piston	352	1585
B.	Piston Used by Franklin.....	352	W
C.	Two Paragraphs from Service Department Bulletin, Sheet No. 262, April 8, 1920, of Franklin Automobile Co., entitled "Long Type Pistons".....	352	1587
D.	Seven paragraphs from Service Department Bulletin, Sheet No. 289, Nov. 11, 1920, of Franklin Automobile Co., entitled "New Design for Series Nine"...	352	1588
E.	Piston Purchased from M. K. Weems..	352	W
F.	Long 1916 Type Piston	352	W
G.	Piston Purchased from Franklin Factory	352	W
H.	Article from Franklin Service Bulletin No. 348, April 18, 1932, of Franklin Automobile Co., entitled "The Oval Type Piston"	352	1589
I.	Article from Page 1, Franklin Service Bulletin No. 369, Feb. 20, 1923, of Franklin Automobile Company, entitled "Piston and Wrist Pin Knocks," and Drawing on page 2, entitled "Drill Jig for Extra Oil Holes in Piston"	352	1591
J.	Forfeited and Abandoned Application of William M. Vennar for Improvement in Pistons, filed April 12, 1920, Serial No. 373,240	354	1595

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K.	Venner Drawing, Feb. 16, 1920.....	354	1603
L.	Letter from George J. Oltsch to Wm. M. Venner, dated Sept. 22, 1920	354	1605
M.	Photostat of page 149, showing Cut only in "The Gasoline Automobile," by Heldt, Vol. I	368	1607
N.	Article from Pages 8 and 9 of Manual for Trouble Shooters of Franklin Automobile Company, entitled "Piston Slap"..	372	1609
O.	Drawing produced by Chadwick, Long 6-Slot Piston	392	1611
P(1&2).	Core Box	392	W
Q.	Core Box	392	W
R.	Small Piston of Type made for Oldsmobile Car or Northway Motor	392	W
S.	Tracing of "Oldsmobile Six" Piston produced by Chadwick	392	1613
T-1.	Tracing produced by Chadwick of Long Pistons for Ford, Model T Car	392	1615
T-2.	Tracing produced by Chadwick of Long Pistons for Essex Car	392	1617
T-3.	Tracing produced by Chadwick of Long Pistons for Duesenberg Car.....	392	1619
U.	Weems' Advertisement on Page 124 of "Motor Age" for July 7, 1921	392	1621
V, V-1 to V-7.	Books of the Weems Company (Marked for Identification, 385).....	...	W
W.	Photostat of Trunk Piston added to by Chadwick to show T-Slot, Long Piston..	396	1623
X.	Digest of Defendants' Exhibit X, Agreement dated Sept. 20, 1919 between E. C. Long and M. K. Weems	407	1625
Y.	Photostat of Drawing by Stellman, Long 1916 Piston (Identified, 452).....	...	1627
Z.	L. M. Stellman's Report, dated March 18, 1919, entitled "Test on Long Pistons"	453	1629

Nos.		Offered Vol. I	Printed Vol. III
AA.	Digest of Defendants' Exhibit AA, License Agreement dated March 20, 1919, between E. C. Long and Franklin Mfg. Co.	454	1632
CC'(1).	Blueprint D-793X of The Aluminum Castings Co. (Drawing of proposed design of piston for H. H. Franklin Mfg. Co.)	466	1633
CC'(2).	Blueprint D-944X of The Aluminum Castings Co. (Drawing of proposed design of piston for H. H. Franklin Mfg. Co.)	466	1634
CC'(3).	Blueprint D-960X of The Aluminum Castings Co. (Drawing of proposed design of piston for H. H. Franklin Mfg. Co.)	466	1635
DD.	Sketch of Long Piston seen by Royalty in 1913	435	1637
EE.	Sketch of Long Piston by Royalty in February, 1918	437	1638
FF.	Sketch of other views of piston shown in Exhibit EE	438	1639
GG.	Photostat of Pattern Record Card marked D-8764	413	1640
HH.	Photostat of Pattern Record Card marked A-640	414	1641
II.	Photostat of Pattern Record Card marked B-122	414	1642
JJ.	Photostat of Pattern Record Card marked H-4	415	1643
KK.	Photostat of Pattern Record Card marked C-123	415	1644
LL.	Card bearing notation, "Use Patt. A-640 as per instructions on core box"	415	1645
MM.	Card bearing designation, "Patt. No. A-641"	422	1646
NN.	Casting	427	W

Nos.		Offered Vol. I	Printed Vol. III
AAA.	Strut Type Piston (Offered as Plaintiff's Exhibit No. 41)	591	W
BBB.	Piston, Six Cylinder Chevrolet	55	W
CCC.	Piston, Four Cylinder Chevrolet	590	W
DDD.	(No Exhibit)	...	....
EEE.	Cut-in-half Piston like Spillman and Mooers	590	W
FFF.	Piston made in Permanent Mold	590	W
3-G.	Cross-section of Piston like Exhibit 1	590	W
3-H.	Cast Iron Type Piston	590	W
3-I.	Clamping Device used as Can Opener	590	W
3-J.	T-slot Piston used in Ford 8	590	W
3-K.	Piston, Silv-O-Lite	590	W
3-L.	Circular of Silv-O-Lite Piston	590	W
3-M.	Willys-Overland Rough Piston Casting (Marked for Identification, 135)	...	W
3-N.	Oakland Rough Piston Casting (Marked for Identification, 135)	...	W
3-O.	T-slot Piston, Another Piston	590	W
3-P.	Small Section, Alleged Spillman and Mooers	590	W
3-Q.	Ribbed Piston, Alleged Franquist 1,153,902 Structure	590	W
3-R.	Half-Section, Gulick Piston	590	W
3-S.	Page 274 of "The Automobile Engineer" of October, 1918, Vol. VIII, No. 119	590	1647
3-T.	Piston in Exemplification of Gulick Patent	590	W
3-U.	Letter, McCoy to J. King Harness, Dec. 30, 1932	590	W
3-V.	Monckmeier Cast Iron Split Skirt Piston	590	W
3-V'.	Kant Skore Piston	590	W

No.		Offered Vol. I	Printed Vol. III
3-W.	Monckmeier Aluminum Split Skirt Piston	590	W
3-X.	Letter, dated June 20, 1916, with Monckmeier Photo	301	1648
3-Z.*	Depositions: Venner, Chadwick, Stellman, Royalty, Saxton, Gilbert	472	W
4-A.	Stellman Sketch of Maynard Patent Structure	590	1649
4-B.	Photostat of Roots Superimposed on Ebbs	590	1651
4-C.	Decision of Law Examiner, dated April 4, 1924, in Interference No. 49,569	532	1653
4-D.	Decision of Law Examiner, dated April 4, 1924, in Interference No. 49,574	532	1659
4-E.	Decision of Law Examiner, dated April 4, 1924, in Interference No. 49,580	532	1661
4-F.	Decision of Law Examiner, dated April 7, 1925, in Interference No. 49,575	532	1663
4-G.	Pages 362, 363 and 364 of "Automotive Industries" for Jan. 29, 1920	537, 591	1667
4-H.	Prior Art Patents	539, 591	....

U. S. PATENTS:

No. 700,309	May 20, 1902	H. E. Ebbs	1671
No. 908,569	Jan. 5, 1909	F. D. Howe	1675
No. 1,031,212	Jul. 2, 1912	E. Van Beyer	1679
No. 1,092,870	Apr. 14, 1914	E. O. Spillman and L. P. Mooers	1683
No. 1,153,902	Sept. 21, 1915	G. E. Franquist	1687
No. 1,174,092	Mar. 7, 1916	W. L. Schoengarth	1693
No. 1,195,936	Aug. 22, 1916	C. White	1699

*Exhibit 3-Z is erroneously referred to in the Narrative, at page 472, as Exhibit 3-Y.

No. 1,229,540	June 12, 1917	E. O. Spillman	1703
No. 1,270,184	Sept. 17, 1918	J. G. Vincent	1707
No. 1,283,031	Oct. 29, 1918	C. C. Anderson	1713
No. 1,294,833	Feb. 18, 1919	H. R. Ricardo	1717
No. 1,325,176	Dec. 16, 1919	A. Spillman	1723
No. 1,395,441	Nov. 1, 1921	E. C. Long	1727
No. 1,489,499	Apr. 8, 1924	E. C. Long	1731
No. 1,872,772	Aug. 23, 1932	E. C. Long	1735

British Patents:

No. 19,559 of 1890	James Roots	1739
No. 17,256 of 1907	John Vernon Pugh	1743
No. 6,826 of 1912	William Frederick Rainforth	1751
No. 12,772 of 1914	Samuel Octavius Ferry	1755
Specification 140,988	Ernest Walter Hives	1759

French Patents:

No. 468,595 of 1914	Chenard and Walcker	1763
	(Translation of foregoing)	1767
No. 434,147 of 1911	M. Chas.-Emile Serex	1769
	(Translation of foregoing)	1773
No. 16,362 of 1912	M. Chas.-Emile Serex	1777
	(Translation of foregoing)	1781

German Patent:

No. 176,988 of 1906	Otto Listemmayer	1785

Additional U. S. Patents:

No. 1,557,825	Oct. 20, 1925	L. M. Stellmann	1789
No. 1,842,022	Jan. 19, 1932	S. D. Hartog	1797
No. 1,499,073	June 24, 1924	L. H. Pomeroy	1803

No.		Offered Vol. I	Printed Vol. IV
5-H$_1$.	Stipulated Digest of the Decision of the Law Examiner in Interference No. 45,351	563	2279
5-H$_2$.	Stipulated Digest of the Decision of the Examiner in Interference No. 45,351...	563	2279
5-H$_3$.	Stipulated Digest of the Decision of the Board of Appeals in Interference No. 45,351	563	2279
5-I.	Books of Account Pages V-1, V-2, V-4..	594	2280
	Bill of Complaint in Case No. 3510 in the U. S. District Court for the Northern District of Ohio, The Cleveland Trust Co. and Chrysler Corp. vs. The Simmons Mfg. Co. and Sterling Products Corp....	....	2285
5-J.	Letter dated October 17, 1932 from Anna Landon Duke to J. H. Brauinga	595	2303
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5-K$_1$.	Letter dated May 4, 1915 from Walter L. Schoengarth to Louis Bagger & Co.	899	2304
5-K$_2$(1).	Tracing of Schoengarth Piston	899	2305
5-K$_2$(2).	Tracing of Schoengarth Piston	899	2307
5-K$_3$.	Three pages Description by Schoengarth of "The Adjustable Gas Engine Piston"	899	2309
5-K$_4$.	Letter dated May 13, 1915 from Louis Bagger & Co. to W. L. Schoengarth....	899	2310
5-K$_5$.	Letter dated May 22, 1915 from W. L. Schoengarth to Louis Bagger & Co.....	899	2311
5-K$_6$.	Letter dated May 27, 1915 from Louis Bagger & Co. to W. L. Schoengarth.....	899	2311
5-K$_7$.	Letter dated July 29, 1914 from W. L. Schoengarth to Louis Bagger & Co.	899	2312
5-K$_8$.	Letter dated August 5, 1915 from Louis Bagger & Co. to W. L. Schoengarth.....	899	2313

Exs.		Offered Vol. II	Printed Vol. IV
5-K$_9$.	Certified copy of Application Papers of the Schoengarth Patent No. 1,174,092 ..	899	2314
5-K$_{10}$.	Schoengarth Piston	907	W
5-K$_{11}$.	Letter dated April 2, 1917 from Lewis Bagger & Co. to Walter Schoengarth....	907	2325
5-K$_{12}$.	Envelope sent to Schoengarth at Cleveland	912	2327
5-L.	Franquist Piston Construction.....	1061	W
5-M.	List of Patents to Packard Motor Company (Discussed, 889)	1091	2329

CASE NO. 4946.

Caption 2331

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CASE NO. 4967.

Caption 2343

Notes Re Trial Papers, Orders, Testimony, Exhibits and Appeal Papers.....2344 to 2354

Orders Extending Time to October 10, 1925 for Filing Transcript of Record in United States Circuit Court of Appeals 2355

Certificate of Clerk 2357

[illegible] EXHIBIT 4-J.

Royalty Report of June 30, 1927 of The Cleveland Trust Company.

(Filed January 27, 1928.)

SUMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1926 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

Licensee	Total Production		Net Sales		Royalties Paid
Aluminum Company of America	159,494		164,795		
	222,569		270,856		
	222,594		220,227		
	24		24		
	201,206		212,219		
	2,215	1,006,097	2,215	1,770,336	$17,703.36
The Kant-Slore Piston Company	41,564		41,564		
	44,322		44,322		
	62,107		61,321		
	56,290	204,243	56,290	203,772	@ 1,017.72
Walker M. Lovett Co., W. M. Lovett Corporation and W. W. Lovett	72,512		72,290		
	48,543		44,294		
	100,139		94,327		
	145,789	374,983	145,306	363,217	@ 3,634.77
The National Piston Company, Inc.	—0—		—0—		
	—0—		—0—		
	—0—		—0—		
	—0—		—0—		
		2,585,723		2,337,353	$23,355.85

Quarterly Statement

ALUMINUM COMPANY OF AMERICA

To The Cleveland Trust Company, Trustee

Cleveland, Ohio

Period 2nd, Quarter 1937 (From April 1st, 1937 to June 30th, 1937)

Total quantity of pistons sold or otherwise disposed of per Exhibit "I" attached	1,133,550	
Less:		
Total quantity of pistons sold for which vouchers have been credited, per Exhibit "II" attached	21,955	
Net		1,111,595 (already repo
Total licensed pistons reported by The Kent-Shaw Piston Company, as made and sold, per Exhibit "III" attached	144,055	
Less:		
Total licensed pistons reported by The Kent-Shaw Piston Company, for which vouchers have been credited	2,519	
Net		141,536
Total licensed pistons reported by Walker M. Lovett, W. M. Lovett Corporation and Walker M. Lovett Company as made and sold, per Exhibit "IV" attached	90,917	
Less:		
Total licensed pistons reported by Walker M. Lovett, W. M. Lovett Corporation and Walker M. Lovett Company for which vouchers have been credited	2,562	
Net		85,855 (already repo
Total licensed pistons reported by The National Piston Company, as made and sold, per Exhibit "V" attached	None	
Less:		
Total licensed pistons reported by The National Piston Company for which vouchers have been credited	80	
Net		80 (already repo
Total licensed pistons reported by..... .....as made and sold, per Exhibit "VI" attached	.....	
Less:		
Total licensed pistons reported by..... .....for which vouchers have been credited	.....	
Net	.....	
Check Total.		
Pistons at royalty rate of $.01 each		
Less: Royalty paid by our Check No. .....dated.....		
Due Royalty Item		

Remarks: .....

.....

.....

.....

Signed: ALUMINUM COMPANY OF AMERICA
By W. P. Kuss,
Vice President.

Note: (1) Statements due quarterly within the months of January, April, July and October.

(2) Royalties due must be paid within thirty days after date of filing quarterly statement.

(3) Oath of Licensee waived by Licensor without relinquishing its right thereto.

EXHIBIT "I"

ALUMINUM COMPANY OF AMERICA

To THE CLEVELAND TRUST COMPANY, Trustee

Cleveland, Ohio

Period 2nd Quarter 1927

(From April 1st, 1927 to June 30th, 1927)

In compliance with license agreement dated April 26, 1924, which the Aluminum Company of America has entered into with you in relation to pistons per se it reports that during the above period:

(A) It sold or otherwise disposed of the following pistons, which embodied, when sold or otherwise disposed of by the licensee, or which to the licensee's knowledge were to be modified or fabricated by the licensee's vendee in such a way as to embody some alleged invention said to be covered by one or more claims of the Letters Patent and application included in said license:

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
Photostat	16	[illegible]	975
1446X	985	[illegible]	2000
1626X	4000	[illegible]	11125
1661X	9000	[illegible]	1000
2126X	771	[illegible]	3110
2176X	48	[illegible]	4100
[illegible]	2000	[illegible]	7000
2476X	6000	[illegible]	812
2496X	400	[illegible]	888
[illegible]	2000	[illegible]	500
2647X	2000	[illegible]	7700
[illegible]	1000	[illegible]	2970

Number of Bowling Machine Parts	Quantity	Number of Bowling Machine Parts	Quantity
[illegible]X	12968	3457X	1249
[illegible]X	350	3458X	1090
[illegible]X	1000	3460X	1143
[illegible]X	150	3470X	5412
[illegible]X	450	3471X	893
[illegible]X	150	3472X	5100
[illegible]X	891	3475X	1005
[illegible]X	500	3510X	3
[illegible]X	1573	3533X	200
[illegible]X	350	3620X	251
[illegible]X	500	3646X	300
[illegible]X	150	3656X	752
[illegible]X	500	3660X	2228
[illegible]X	514	3694X	611
[illegible]X	1524	3720X	765
[illegible]X	1504	3728X	1114
[illegible]X	2750	3739X	1
[illegible]X	1725	3773X	1177
[illegible]X	6985	3783X	299
[illegible]X	3000	3784X	202
[illegible]X	4	3807X	447
[illegible]X	1800	3843X	57
[illegible]X	83855	3844X	2
[illegible]X	500	3876X	14162
[illegible]X	538988	3928X	1778
[illegible]X	1933	3929X	38
[illegible]X	2005	3944X	5
[illegible]X	4884	3961X	2
[illegible]X	10978	3963X	750
[illegible]X	500	3979X	147
[illegible]X	4000	3981X	913
[illegible]X	1471	4006X	14
[illegible]X	1798	4016X	19
[illegible]X	95	4017X	4
[illegible]X	2942	4020X	3
[illegible]X	48130	4024X	19
[illegible]X	1010	4026X	1769
[illegible]X	48130	4044X	19

Total "A" over

Exhibit "I"

ALUMINUM COMPANY OF AMERICA

To The Cleveland Trust Company, Trustee

Cleveland, Ohio

Period 2nd Quarter 1927

(From April 1st, 1927 to June 30th, 1927)

In compliance with license agreement dated April [illegible], 1924, which the Aluminum Company of America has entered into with you in relation to pistons per se it reports that during the above period:

(A) It sold or otherwise disposed of the following pistons, which embodied, when sold or otherwise disposed of by the licensee, or which to the licensee's knowledge were to be modified or fabricated by the licensee's vendee in such a way as to embody some alleged invention said to be covered by one or more claims of the Letters Patent and application included in said license:

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
		4074X	315
		4075X	850
		4082X	16
		4083X	68
		4084X	493
		4097X	1640
		4100X	500
		4101X	433
		4106X	10
		4109X	313
		4110X	500
		4111X	500
		[illegible]	68
		[illegible]	[illegible]
		4173X	57
		[illegible]	[illegible]
		[illegible]	25
		[illegible]	11
		[illegible]	25
		[illegible]	51
		[illegible]	[illegible]
		[illegible]	9
		[illegible]	13
		[illegible]	25
		Total "A"	[illegible]

EXHIBIT "H"

ALUMINUM COMPANY OF AMERICA

To THE CLEVELAND TRUST COMPANY, Trustee

Cleveland, Ohio

Period 2nd Quarter 1937

(From April 1st, 1937 to June 30, 1937)

(B) And the following is the number of such pistons sold by the licensee and for which our vendees have been credited during such period:

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
Photostat	10	4109X	14
1829X	2	4110X	2
1861X	1269	4159X	9
2263X	125	4169X	6015
2403X	15	4173X	53
2484X	1	4239X	428
2485X	12		
2487X	4		
2489X	295		
2500X	4		
2502X	20		
2541X	5		
2743X	1		
2759X	19		
2765X	1		
2766X	2		
2767X	77		
2770X	6		
2788X	8		
2804X	2402		
2809X	5		
2854X	2777		
2911X	600		
2965X	2		
2966X	72		
2968X	60		
2969X	1		
2984X	96		
2987X	19		
2988X	17		
2990X	32		
3000X	614		
3006X	168		

Number of Bearing Eliminating Piston	Quantity	Number of Bearing Eliminating Piston	Quantity
3216X	1731		
3246X	8		
3267X	17		
3402X	424		
3406X	76		
3470X	4		
3471X	2		
3472X	4		
3619X	106		
3646X	1		
3656X	3		
3694X	16		
3773X	2		
3807X	14		
3876X	5948		
4057X	46		
4058X	10		
4106X	10		
		Total "B"	21945

EXHIBIT "III"

ALUMINUM COMPANY OF AMERICA

To THE CLEVELAND TRUST COMPANY, *Trustee*

Cleveland, Ohio

Period 1927 Quarter 2nd

(From April 1, 1927 to June 30, 1927)

(C) Licensed Pistons reported by The Kant-Skore Piston Company of Cincinnati, Ohio, as made and sold during such period; as per copy of report attached.

Number of Bearing Eliminating Piston	Quantity	Number of Bearing Eliminating Piston	Quantity
		433	23031
		434	119264
		15	2810
		Total "C"	145105

(D) Licensed pistons reported by The Kant-Skore Piston Company for which its vendees have been credited during such period; as per copy of report attached.

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
		433	1778
		434	1061
		Total "D"	2839
		Net	141836

EXHIBIT "IV"

ALUMINUM COMPANY OF AMERICA

To THE CLEVELAND TRUST COMPANY, *Trustee*

Cleveland, Ohio

Period 1927 Quarter 2nd.

(From April 1927 to June 30, 1927)

(E) Licensed pistons reported by Walker M. Levett, W. M. Levett Corporation and Walker M. Levett Company, of New York City, as made and sold during such period; as per copy of report attached.

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
		CA 1	36,440
		2	23,903
		3	11,761
		5	12,732
		6	3,126
		11	618
		13	2,085
		14	7,552
		Total "E"	98,217

(F) Licensed pistons reported by Walker M. Levett, W. M. Levett Corporation and Walker M. Levett Company, of New York City, for which their vendees have been credited during such period; as per copy of report attached.

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
		1	40
		2	962
		3	172
		5	886
		6	439
		13	3
		Total "F"	2,562
		Net	95,655

EXHIBIT "V"

ALUMINUM COMPANY OF AMERICA

To THE CLEVELAND TRUST COMPANY, Trustee
Cleveland, Ohio

Period 2nd. Quarter 1927

(From April 1st, 1927 to June 30th, 1927)

(G) Licensed Pistons reported by The National Piston Company, of New York City, as made and sold during such period; as per copy of report attached.

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
		Total "G"	None

(H) Licensed Pistons reported by The National Piston Company, for which its vendees have been credited during such period; as per copy of report attached.

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
		Total "H"	80
		Net	80

QUARTERLY STATEMENT
OF
LICENSED PISTONS SOLD OR OTHERWISE DISPOSED OF
BY
THE KANT-SKORE PISTON COMPANY
A SUB-LICENSEE OF ALUMINUM COMPANY OF AMERICA
DURING
Period 1927 Quarter 2nd
(From April 1, 1927 to June 30, 1927)

To Aluminum Company of America
Pittsburgh, Pa.

In compliance with license agreement which the undersigned has with you in relation to pistons per se, it reports that during the above period:

(C) It made and/or sold or otherwise disposed of the following pistons which contained or embodied some invention covered by or which were sold, or were after sale or at any other time modified, or to be, or capable of being modified so as to be covered by any one or more of the claims of any of the U. S. Patents or Applications included in the contract between Aluminum Company of America and The Cleveland Trust Company, dated April 26, 1924 and marked "I."

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
		433	22821
		434	119264
		15	2610
		Total Item C	144695

(D) The following is the number of such pistons sold by the licensee and for which the vendees have been credited during such period:

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
		433	1778
		434	1061
		Total Item D	2839
		Net	141856

Remarks:

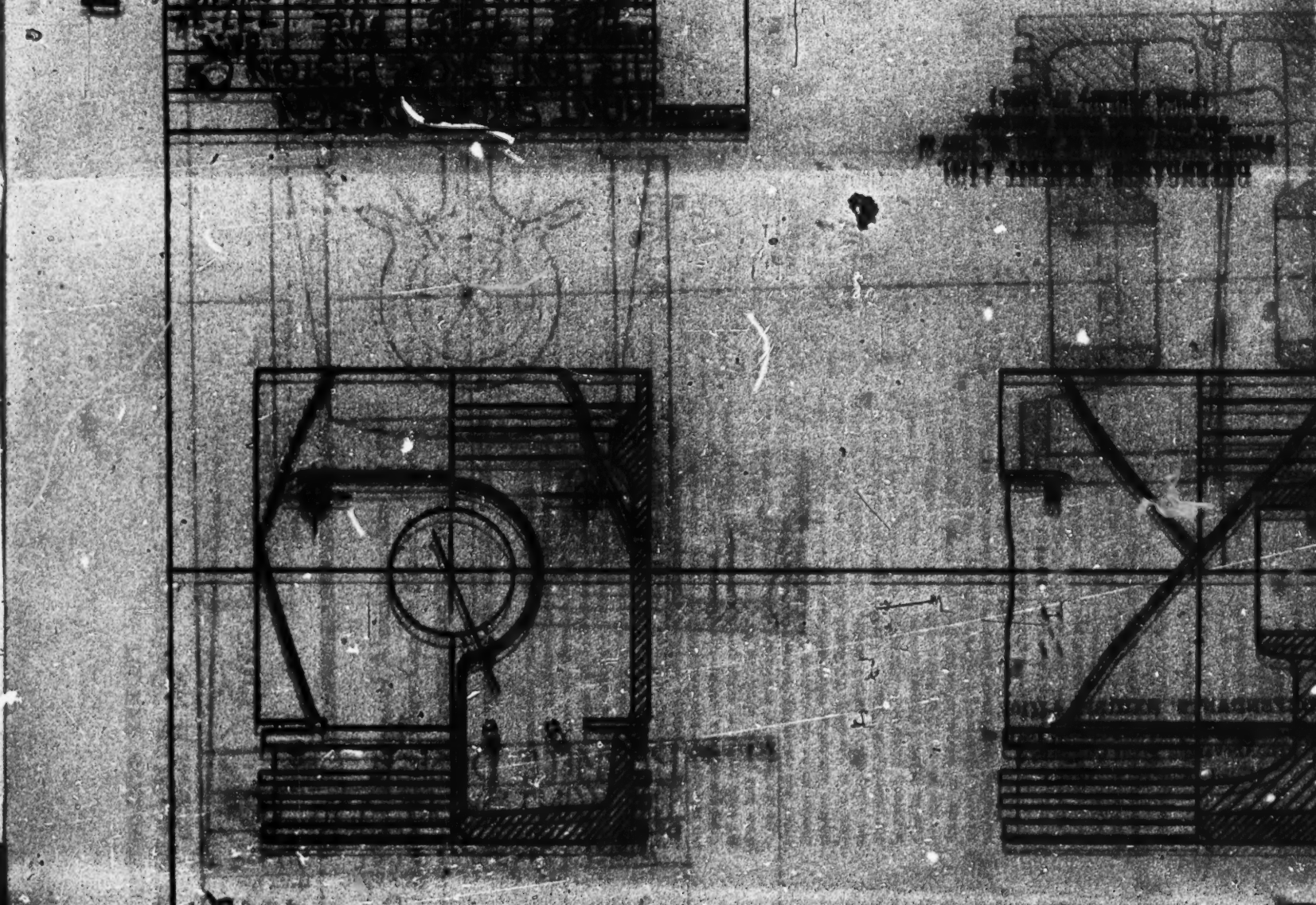
Signed: The Kant-Skore Piston Company,
By H. J. Hayes, Treas.

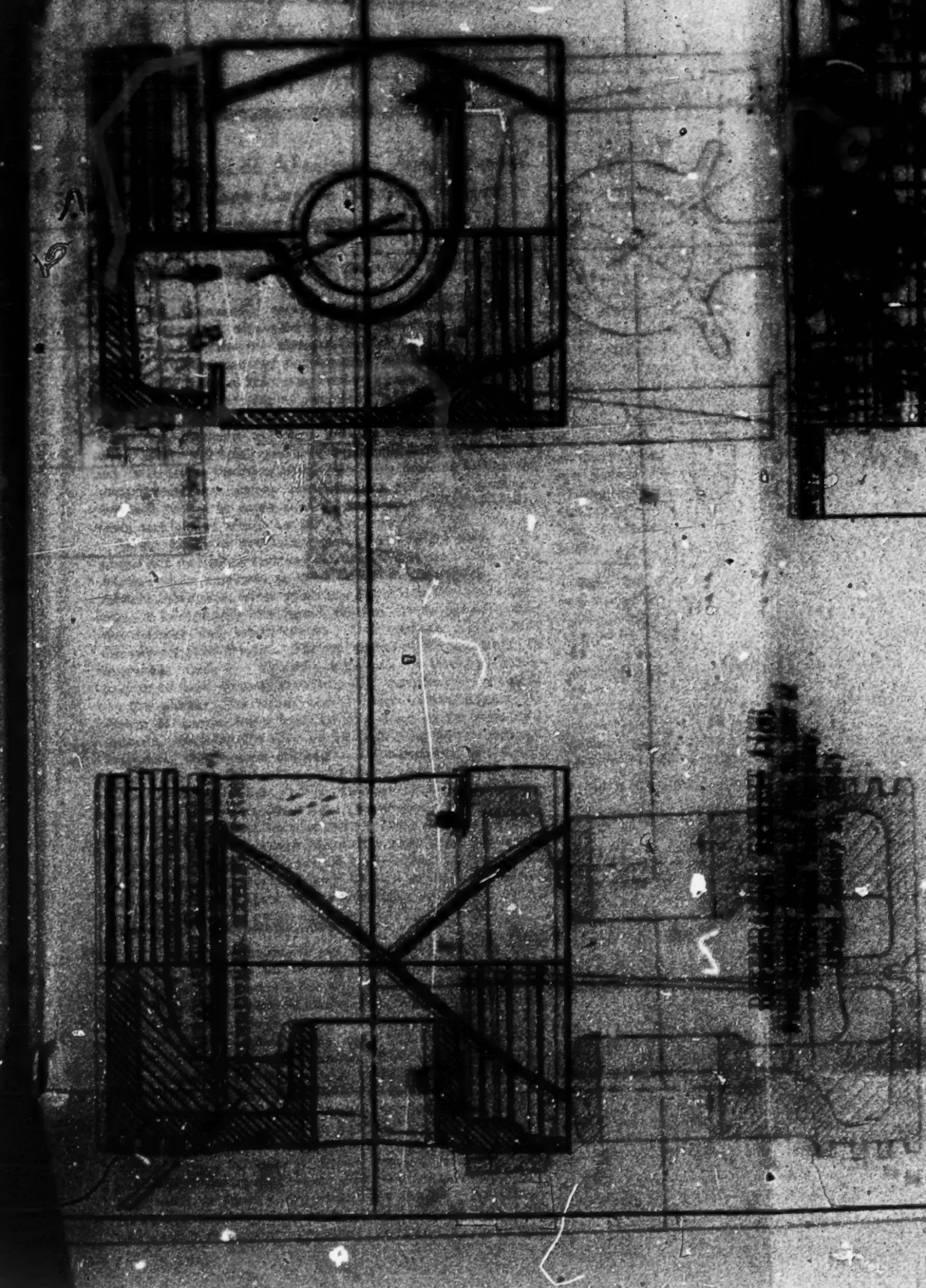
Note: (1) Statements due quarterly within the months of January, April, July and October.

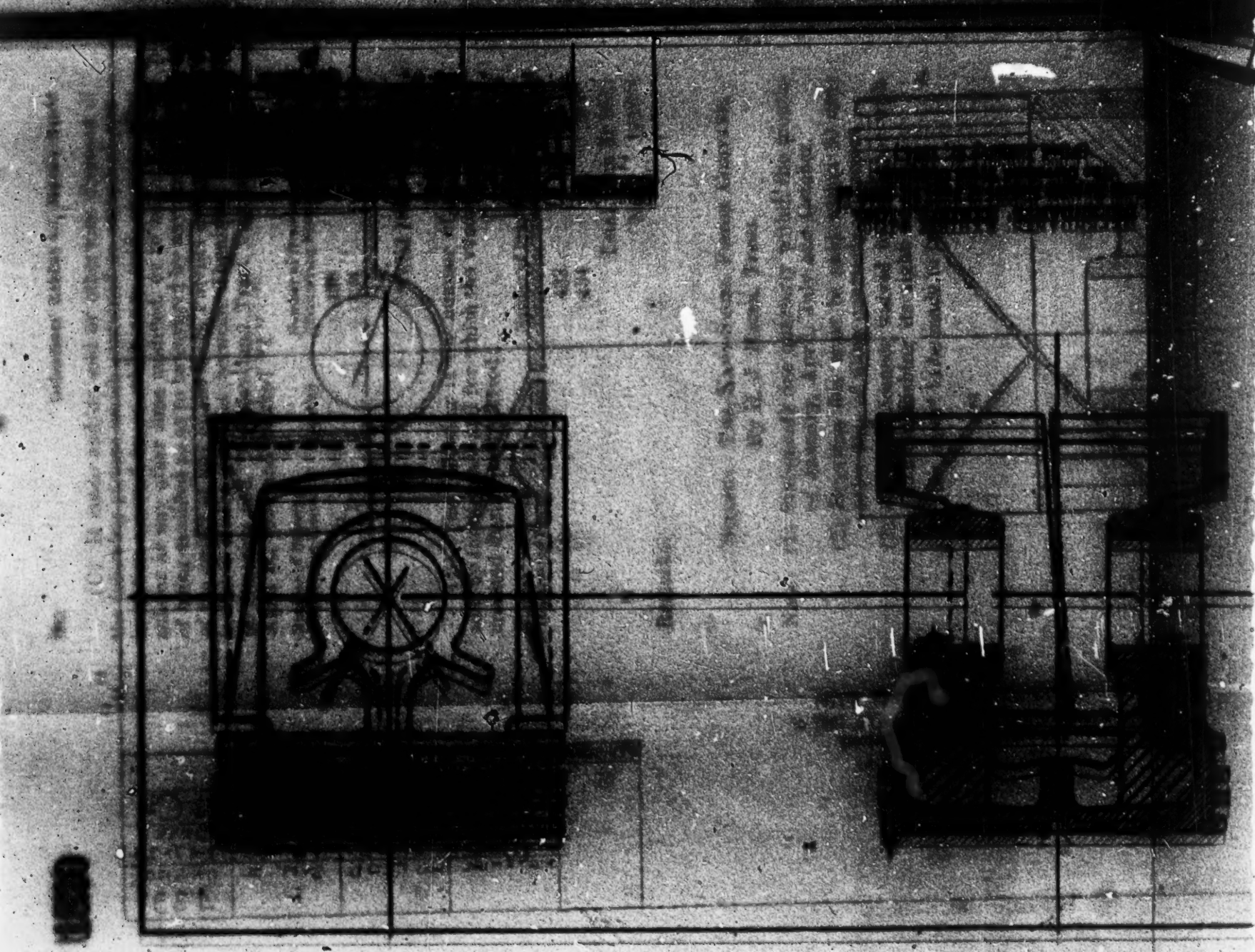
(2) Royalties due must be paid within 30 days after date of filing quarterly statement.

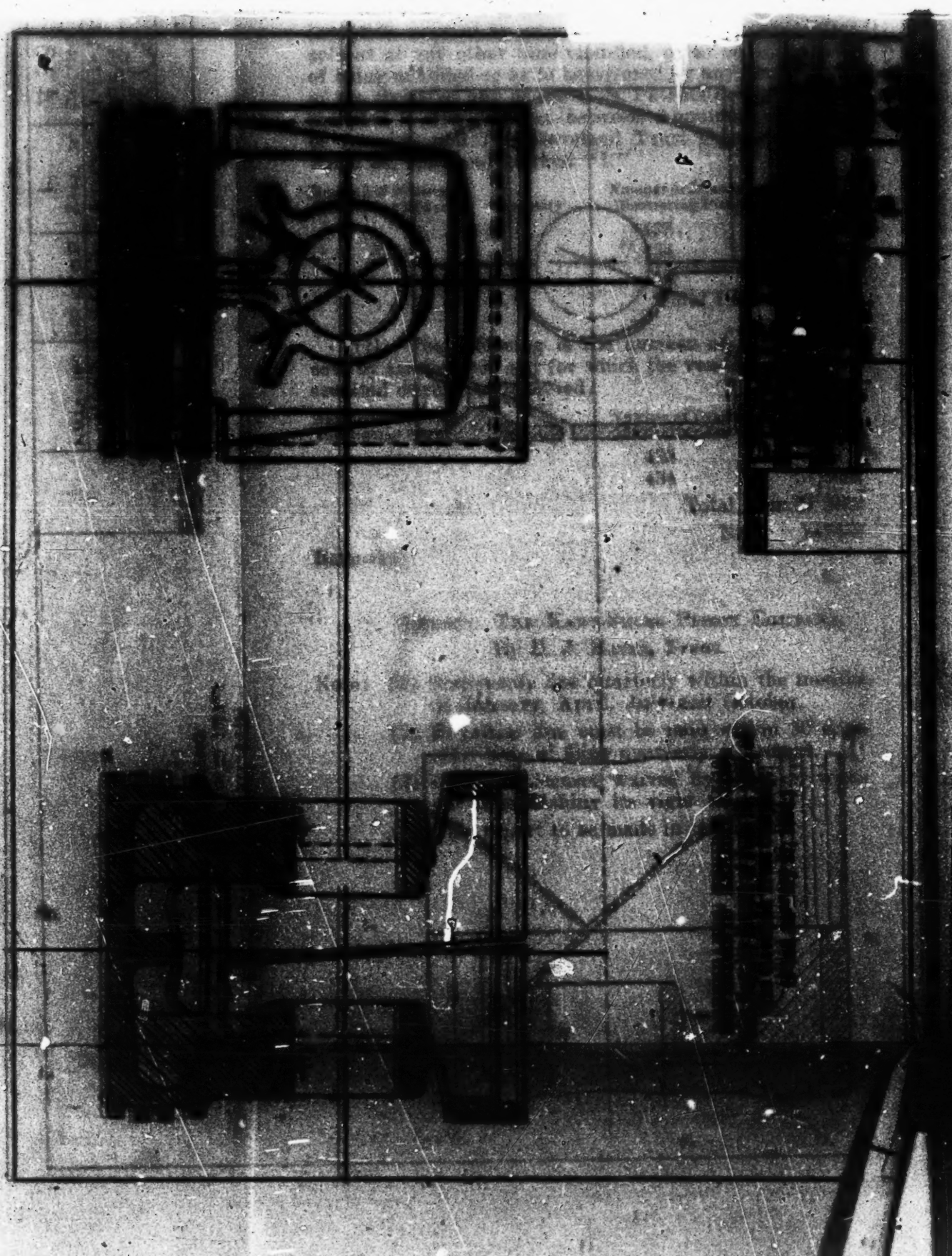
(3) Oath of Licensee waived by Licensor without relinquishing its right thereto.

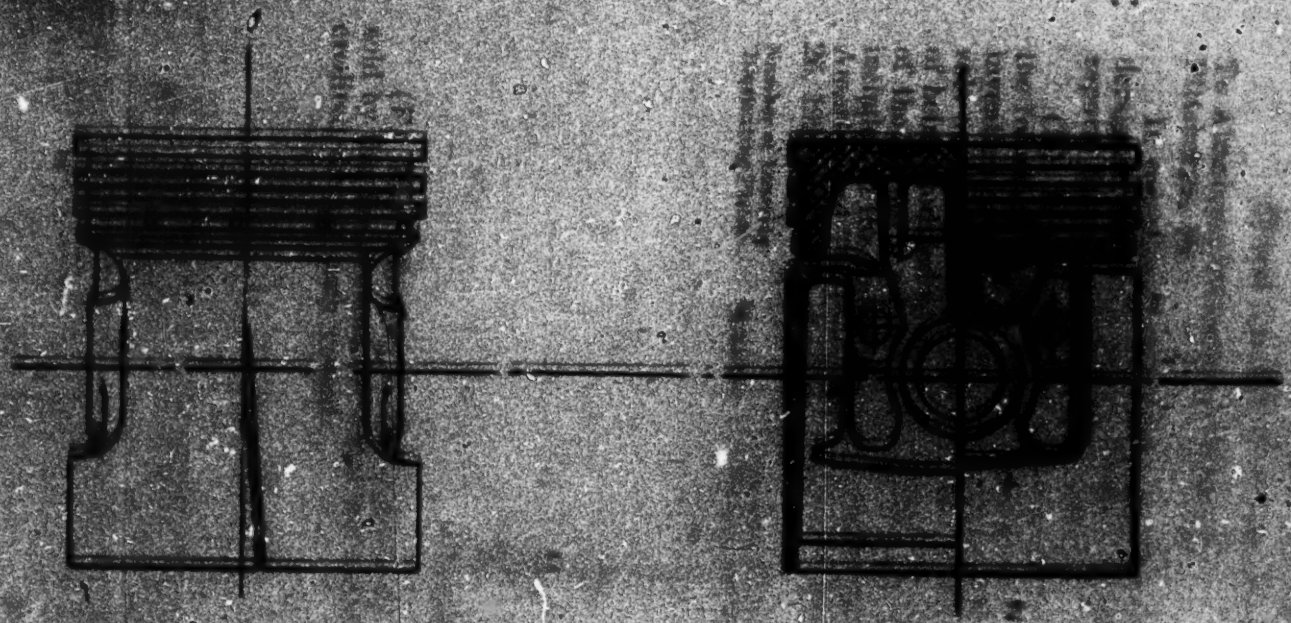
(4) This report to be made in triplicate.

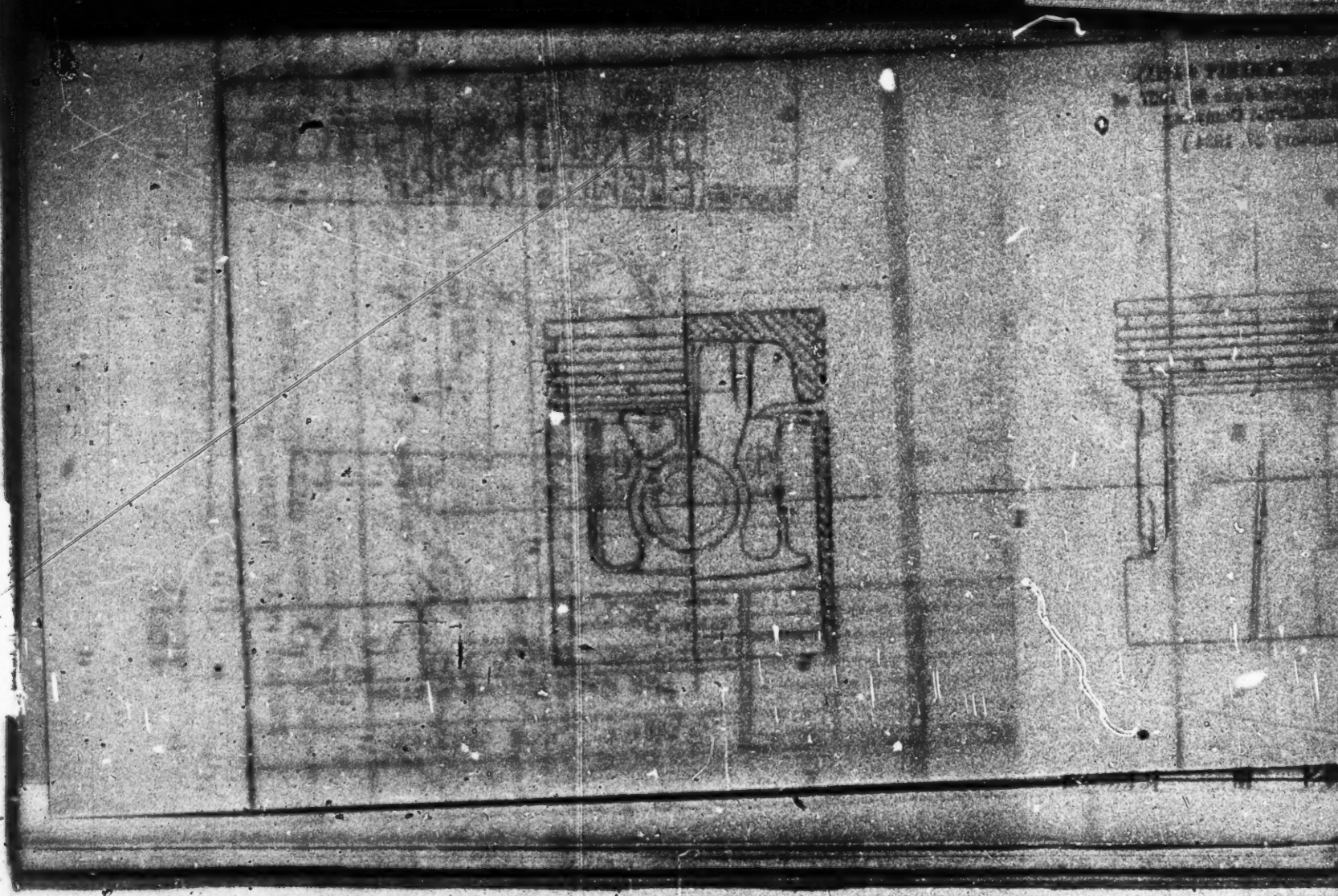












Quarterly Statement

of

Licensed Pistons Sold or Otherwise Disposed of

by

WALKER M. LEVETT CO., W. M. LEVETT CORPORATION AND W. M. LEVETT (CALLED LEVETT)

A SUB-LICENSEE OF ALUMINUM COMPANY OF AMERICA

hunting

Period 1927 Quarter 2nd

(From April 1927 to June 30, 1927)

To Aluminum Company of America
Pittsburgh, Pa.

In compliance with license agreement which the undersigned has with you in relation to pistons per se, it reports that during the above period:

(E) It made and/or sold or otherwise disposed of the following pistons which contained or embodied some invention covered by or which were sold, or were after sale or at any other time modified, or to be, or capable of being modified so as to be covered by any one or more of the claims of any of the U. S. Patents or applications included in the contract between Aluminum Company of America and The Cleveland Trust Company, dated April 26, 1924 and marked "I."

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
		CA 1	36440
		2	23903
		3	11761
		5	12732
		6	3126
		11	618
		13	2035
		14	7552
		Total Item E	98317

(F) The following is the number of such pistons sold by the licensee and for which the vendees have been credited during such period:

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity
		1	40
		2	982
		3	172
		5	696
		6	499
		13	3
		Total Item F	2562
		Net	95655

Remarks:

Signed: WALKER M. LEVETT CO., W. M. LEVETT CORPORATION AND W. M. LEVETT
By R. E. VALCOURT, *Sec'y.*

Note: (1) Statements due quarterly within the months of January, April, July and October.

(2) Royalties due must be paid within 30 days after date of filing quarterly statement.

(3) Oath of Licensee waived by Licensor without relinquishing its right thereto.

(4) This report to be made in triplicate.

QUARTERLY STATEMENT

OF

LICENSED PISTONS SOLD OR OTHERWISE DISPOSED OF

BY

THE NATIONAL PISTON COMPANY, INC.

A SUB-LICENSEE OF ALUMINUM COMPANY OF AMERICA

DURING

Period 2nd Quarter 1927

(From April 1st to June 30th)

To Aluminum Company of America
Cleveland, Ohio.

In compliance with license agreement which the undersigned has with you in relation to pistons per se, it reports that during the above period:

(G) It made and/or sold or otherwise disposed of the following pistons which contained or embodied some invention covered by or which were sold, or were after

sale or at any other time modified, or to be, or capable of being modified so as to be covered by any one or more of the claims of any of the U. S. Patents or applications included in the contract between Aluminum Company of America and The Cleveland Trust Company, dated April 26, 1924 and Marked "I."

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity

Total Item G None

(H) The following is the number of such pistons sold by the licensee and for which the vendees have been credited during such period:

Number of Drawing Illustrating Piston	Quantity	Number of Drawing Illustrating Piston	Quantity

Total Item H 80

Net (80)

Remarks:

Signed: The National Piston Company, Inc.
By F. M. Taylor.

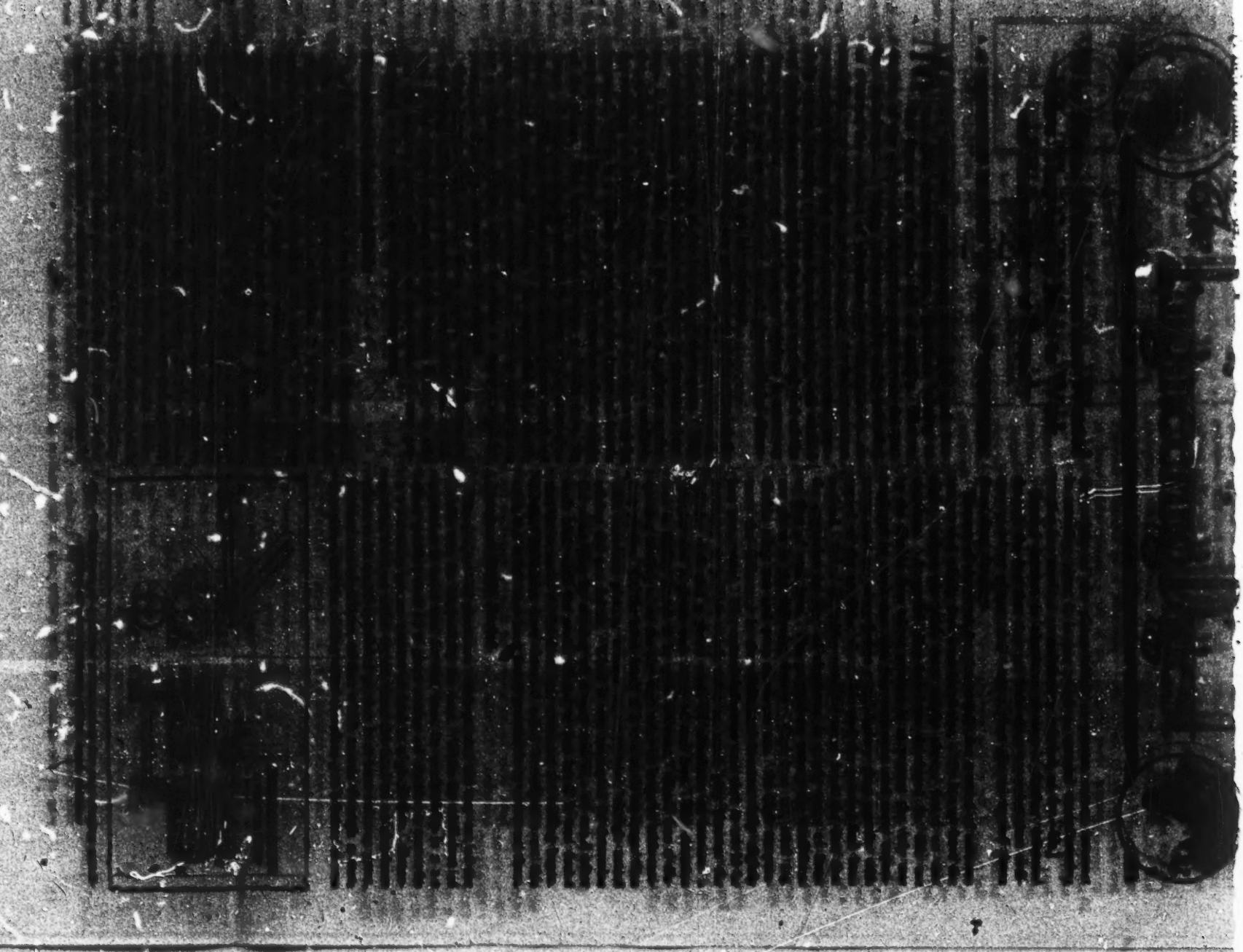
Note: (1) Statements due quarterly within the months of January, April, July and October.

(2) Royalties due must be paid within 30 days after date of filing quarterly statement.

(3) Oath of Licensee waived by Licensor without relinquishing its right thereto.

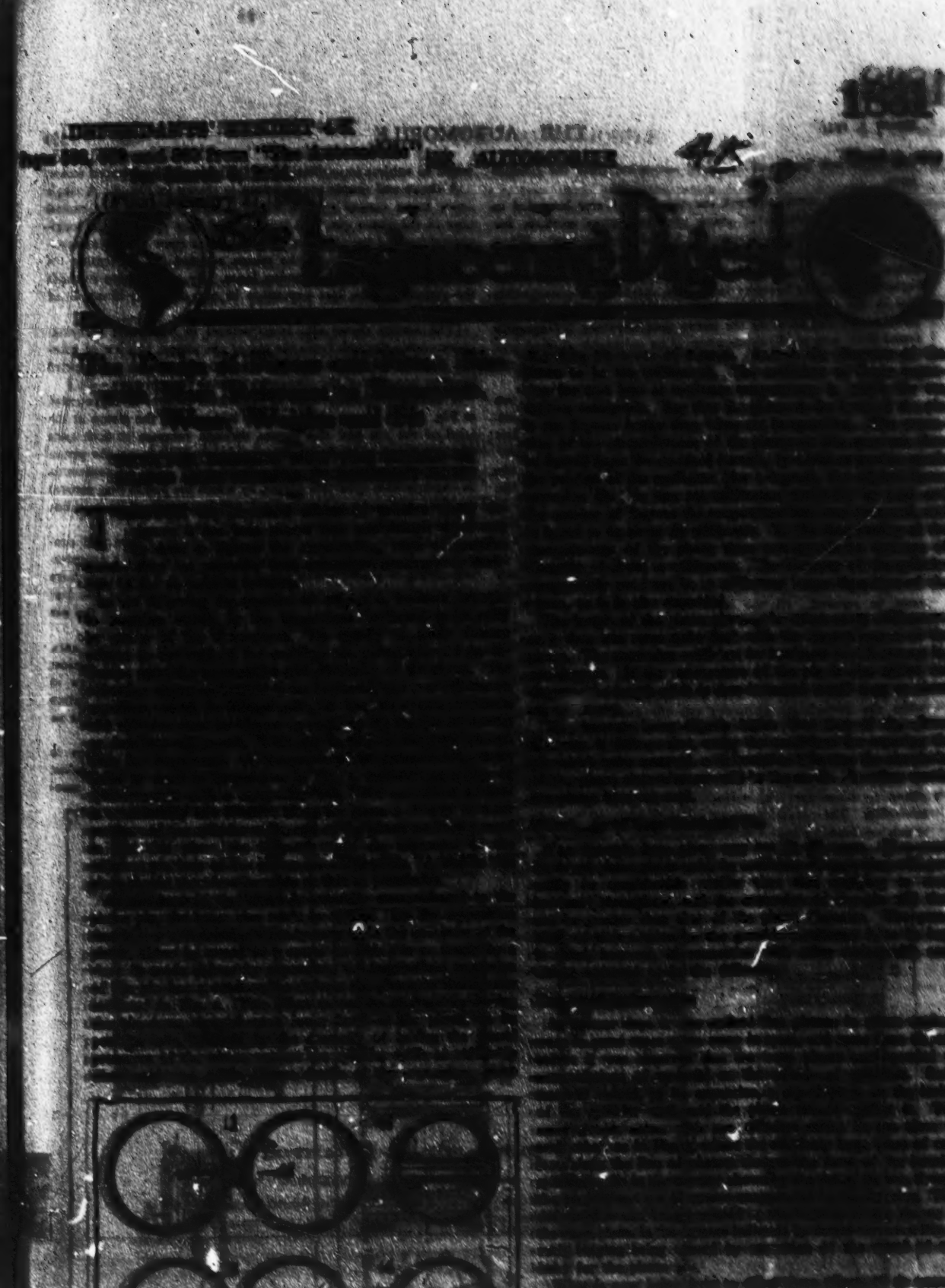
(4) This report to be made in triplicate.

1826.



[redacted]

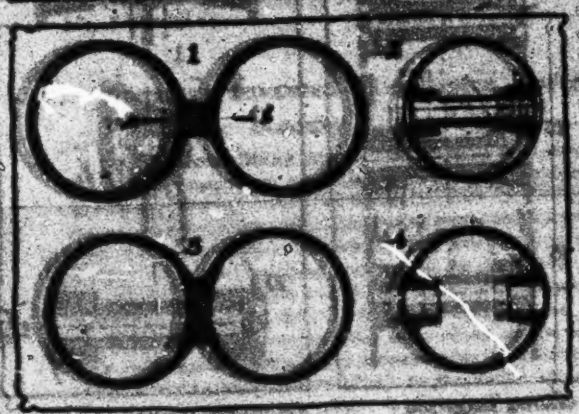
1929

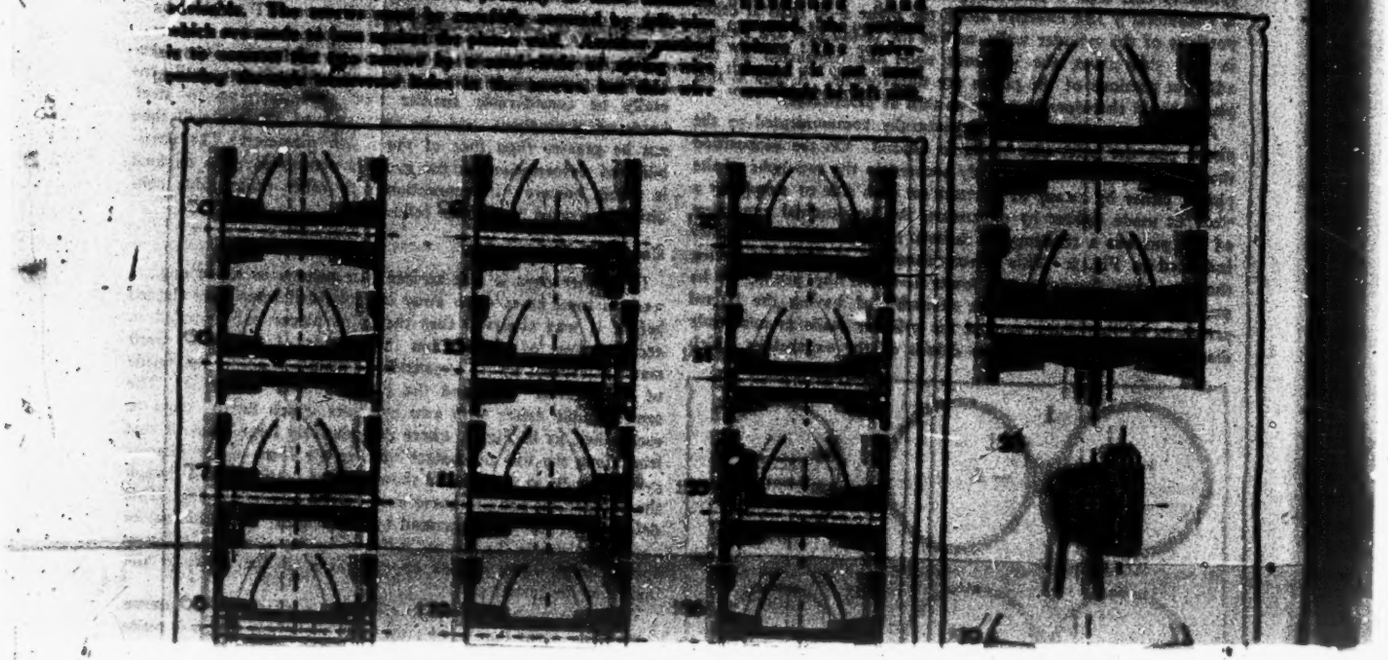


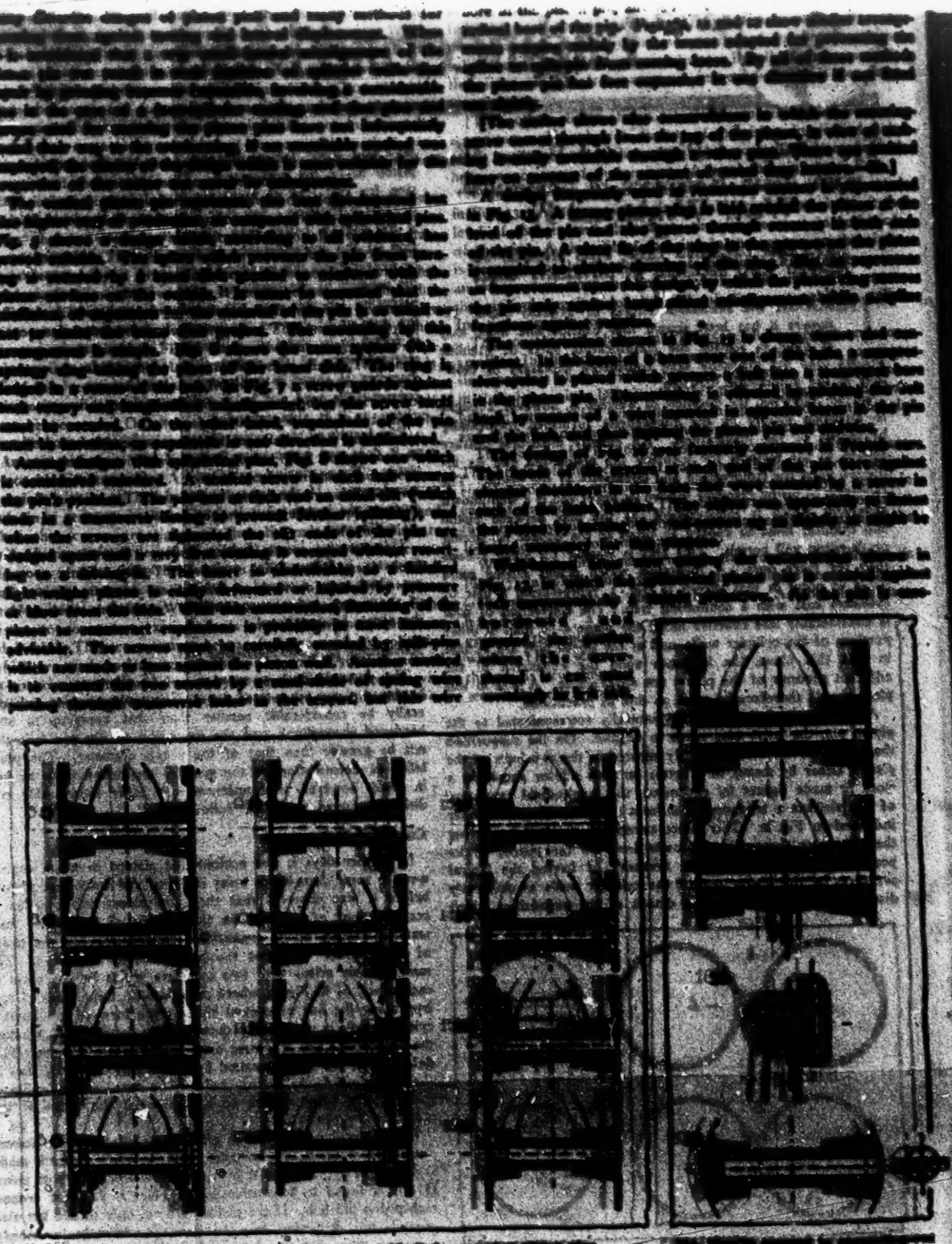
(From Engineering, January 27, 1928.)

The Engineering Digest

The Design of Pinion and Pinion Bits with Bits Reference to Repairs, Wear, Weights and Fit







In the large majority of constructions the connecting-rod turns upon the pin and the latter is stationary, but in a few instances the pin is secured in the connecting-rod and the latter turns in bushings in the links. Fig. 18 shows a design of this type. The connecting-rod is slit and secured to the recessed piston pin by a cotter bolt. Expansion of the pin is here wholly without influence upon the elasticity of the pistons.

Fig. 19 shows a plan used for heavy motors. At the small end of the conical pin there is milled out a recess in which there is fitted a yoke projecting into notches in the links. A small screw with a leaf spring interacting with a notch in the end of the piston pin secures the yoke.—*From Der Motorwagen*, February 10.

Dry Disk Clutch and Mitred Sliding Gear in Leading French Sixer

AMONG construction features departing from standard design in the six-cylinder 35-50-horsepower Delaunay-Belleville cars the most noticeable relate to the clutch, shown in Fig. 20, and the transmission gear, Fig. 21. The multiple-disk clutch is composed of sheet steel disks lined with thermoid washers and inserted in a cup secured to the flywheel. The cup is perforated to allow heat to escape and is provided with lugs on which the driving disks are mounted. The action is dry, and

Figs. 20 and 21—Clutch and gears of Delaunay-Belleville three

centrifugal action is depended upon to keep dust out. The minimizing of maintenance is the object in view. Two universals are used on the clutch shaft.

The characteristic of the transmission gear lies in the use of mitre gears for the third speed as well as for the reverse, with silence in view for the drives most frequently used. The difficulties which were encountered in the matter of getting a mitred gear to slide into engagement as easily as a straight one, especially in the case of the third speed, were overcome, it is said, only after prolonged experimentation. Other difficulties related to the end-thrust pressures created by the operation of these gears. Both the primary and the secondary shafts are supported at the middle by ball-bearings.—*From La Vie Automobile*, February 14.

Bugatti's Inverted ¾-Elliptic Spring for Roomy Light Cars

AMONG recent British patents Eric Walford finds one for a spring suspension taken out by Bugatti, whose leap to prominence among makers of light fast cars in Europe has caused widespread attention. The patent shows an improvement over the quarter-elliptic anchored to the extreme rear of the vehicle frame and reaching forward to the axle with which

Aside from imparting to a car with short wheelbase the easy body movements which are normally obtained only by a longer wheelbase—which advantage it shares with the previous and better known type—the improved but more complicated spring seems to ensure an almost straight up-and-down movement of the axle, since the flexions of the two springs counteract each other with regard to the axle movement. Very little sliding motion in the universals will thus result from shocks, and brake action will also be more uniform. In addition it may perhaps be possible to obtain desirable effects by having the springs so proportioned that the oscillations of one break up those of the other. The special design of the semi-elliptic, which will make it flex into an S-shape, must be severe on the clip but apparently results in an efficient utilization of the amount of steel in it.—Ed.]

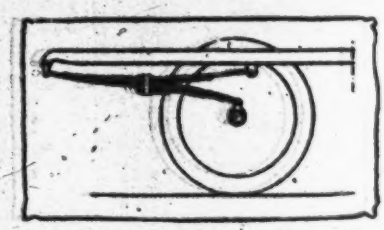


Fig. 22—New Bugatti spring for short wheelbases

New System for Keeping Voltage Constant Heralded from England

AN interesting new system for keeping the current delivered by a dynamo for lighting purposes in an automobile at a constant voltage, independently of the speed of the motor, is brought out by the Spiral Regulating Dynamo Company of London, England, and is illustrated in Figs. 23 and 24. The armature shaft is in the form of a sleeve riding upon a main shaft, in the surface of which there is cut a spiral groove of geometrically progressive pitch. A steel ball lodged in the spiral groove and at the same time in a straight groove in the hollow of the armature shaft maintains a driving-connection between these two shafts. The main shaft is driven, and if its speed is increased the armature tends to lag behind, owing to the increased magnetic pull between it and the pole pieces. The lagging is made possible by the nature of the driving-connection and therefore takes place, the armature shaft sliding along the main shaft against the resistance of a helical spring, and by this action the armature is withdrawn from its position in the magnetic field between the pole pieces. By suitably proportioning the strength of the spring and the pitch of the spiral groove, the effect of this lateral displacement of the armature with relation to the field can be so regulated that the actual number of lines of force cut by the armature windings during a given period of time is kept constant—this determining the voltage.

In addition to the main control, it is necessary at very low speeds to prevent the current from the battery from flowing through the armature coils and thus going to waste, as it has a tendency to do whenever the voltage of the battery current exceeds the voltage of the dynamo. To this end, whenever the motor speed falls off and the armature moves to the right, far enough, it engages a trigger attached to a movable contact piece and thereby causes it to slide out of engagement with the fixed contact piece, breaking the connection with the battery. On the other hand, when the armature moves to the left with increase of the motor speed, it is released from the trigger, a small spring forces the contacts together and the circuit is re-established.

[illegible] of the form [illegible], as shown, a design of this type. The connecting-rod is slit and secured to the crossed pivot pin by a cotter bolt. Reposition of the pin is here wholly without influence upon the elasticity of the pivots.

Fig. 19 shows a plan used for heavy motors. At the small end of the conical pin there is milled out a recess in which there is laid a yoke projecting into notches in the [illegible]. A small screw with a leaf spring interacting with a notch in the end of the pivots pin secures the yoke.—*From Der Motorwagen, February 10.*

Dry Disk Clutch and Mitred Sliding Gear in Leading French Sixer

AMONG conspicuous features departing from standard design in the six-cylinder 25-30-horsepower Delaunay-Belleville cars the most noticeable relate to the clutch, shown in Fig. 20, and the transmission gear, Fig. 21. The multiple-disk clutch is composed of sheet steel disks lined with thermoid washers and inserted in a cup secured to the flywheel. The cup is perforated to allow heat to escape and is provided with interior ribs which retain alternate disks. The action is dry, and

Figs. 20 and 21—Details and gears of Delaunay-Belleville three

centrifugal action is depended upon to keep dust out. The minimizing of maintenance is the object in view. Two universals are used on the clutch shaft.

The characteristic of the transmission gear lies in the use of mitre gears for the third speed as well as for the reverse, with silence in view for the drives most frequently used. The difficulties which were encountered in the matter of getting a mitred gear to slide into engagement as easily as a straight one, especially in the case of the third speed, were overcome, it is said, only after prolonged experimentation. Other difficulties related to the end-thrust pressures created by the operation of these gears. Both the primary and the secondary shafts are supported at the middle by ball-bearings.—*From La Vie Automobile, February 14.*

Bugatti's Inverted ¾-Elliptic Spring for Roomy Light Cars

A MONG current British patents Ettore Bugatti finds one for a spring suspension device put by Bugatti, whose leap to prominence among makers of light fast cars in Europe I [illegible] widespread attention. The patent shows an improvement over the quarter-elliptic underslung as used at the [illegible] frame and reaching forward to the axle, which [illegible] Bugatti cars of 1914 model now in use are equipped and which is also used on small Peugeot cars under license, and it appears that Bugatti declares the more recent design to have been found quite superior. The accompanying illustration shows the new spring to be a semi-elliptic to the middle of which a forwardly-reaching quarter-elliptic is clipped.—From *The Automobile Engineer, February.*

former inverse type—the improved but more complicated spring seems to ensure an almost straight up-and-down movement of the axle, since the distance of the two springs measured each other with regard to the axle movement. Very little sliding motion is, the universals still thus result from shocks, and brake action will also be more uniform. In addition it may perhaps be possible to obtain desirable effects by having the springs so proportioned that the oscillations of one break up those of the other. The special design of the semi-elliptic, which will make it flex into an S-shape, must be severe on the clip but apparently results in an efficient utilization of the amount of steel in it.—Ed.]

Fig. 22—New Bugatti spring for short wheelbases

New System for Keeping Voltage Constant Heralded from England

AN interesting new system for keeping the current delivered by a dynamo for lighting purposes in an automobile at a constant voltage, independently of the speed of the motor, is brought out by the Spiral Regulating Dynamo Company of London, England, and is illustrated in Figs. 23 and 24. The armature shaft is in the form of a sleeve riding upon a main shaft, in the surface of which there is cut a spiral groove of geometrically progressive pitch. A steel ball, lodged in the spiral groove and at the same time in a straight groove in the hollow of the armature shaft maintains a driving-connection between these two shafts. The main shaft is driven, and if its speed is increased the armature tends to lag behind, owing to the increased magnetic pull between it and the pole pieces. The lagging is made possible by the nature of the driving-connection and therefore takes place, the armature shaft sliding along the main shaft against the resistance of a helical spring, and by this action the armature is withdrawn from its position in the magnetic field between the pole pieces. By suitably proportioning the strength of the spring and the pitch of the spiral groove, the effect of this lateral displacement of the armature with relation to the field can be so regulated that the actual number of lines of force cut by the armature windings during a given period of time is kept constant—this determining the voltage.

In addition to the main control, it is necessary at very low speeds to prevent the current from the battery from flowing through the armature coils and thus going to waste, as it has a tendency to do whenever the voltage of the battery current exceeds the voltage of the dynamo. To this end, whenever the motor speed falls off and the armature moves to the right, far enough, it engages a stopper attached to a movable contact piece and thereby causes it to slide out of engagement with the fixed contact piece, breaking the connection with the battery. On the other hand, when the armature moves to the left with increase of the motor speed it is released from the stopper, a small spring forces the contacts together and the circuit is re-established. This cut-out switch arrangement is shown in Fig. 23.

With this system it has been shown that the lamps can be lighted directly from the dynamo, as may be desirable if the battery should fail. It is also claimed that the power consumed in running the dynamo is constant, since the magnetic torque is constant and no power is wasted in creating counter-currents at any motor speed.—From *The Auto*, February 14.

IN RE FILE WRAPPERS.

PRINTER'S NOTE: The system of typography employed in the following File Wrappers (Defendants' Exhibits, 4-L, 4-L_1, 4-L_2, 4-L_3, and 4-L_4) to simulate Patent Office markings, is as follows:

1. Words or phrases cancelled are indicated by "cancelled" type;
2. Words or phrases inserted *in substitution for words cancelled* and words or phrases added (other than of the kind indicated in paragraph 3) are indicated by "black-letter" type;
3. Words or phrases added or inserted by way of amendment of claims are indicated by "italic" type;
4. The insertion of whole new claims is indicated by the use of light rule above and below and along the left margin of such claims.
5. Cancellation of sentences or paragraphs by the drawing of diagonal cancellation lines across the face thereof is indicated by the use of heavy black rule above and below and along the left margin of the portions cancelled.
6. Marginal notations are indicated by block indentions, with black letter words or figures therein, opposite the cancellation or addition.

DEFENDANTS' EXHIBIT 4-L.

File Wrapper and Contents of Gulick Patent in Suit.

(Filed January 27, 1934.)

390

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the records of this office of the File Wrapper and Contents, in the matter of the Letters Patent of Edward J. Gulick, Assignor, by Mesne Assignments, to The Cleveland Trust Company, Number 1,815,733, Granted July 21, 1931, for Improvement in Pistons.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this fourteenth day of January, in the year of our Lord one thousand nine hundred and thirty-three and of the Independence of the United States of America the one hundred and fifty-seventh.

THOMAS E. ROBERTSON,
Commissioner of Patents.

(Seal)

ATTEST: D. E. WILSON,
Chief of Division.

(Old Wrapper with Record of Actions Inside)

Number (Series of ~~1925~~ 1915) 1,815,733
204661

PATENT No. 1815733

1917

Dated Jul 27 1931

Div. 12 (Ex'r's Book) 147-179-B

Name Edward J. Gulick
of
State of (See jacket inside)
Invention

Original Renewed

Application filed complete 19

PARTS OF APPLICATION FILED

Petition, Specification, Oath, First Fee $20, 1 sheets Drawings, , 19

Certificate of Correction September 22, 1931

Examined and passed for Issue May 16 1931 , 1931
C. C. Henry Exr. Div. 12
Notice of Allowance May 16 1931
By Commissioner.
Ex cl $13.00
Final Fee $25 June 18, 1931
Ex cl $10.00 June 25, 1931
Attorney
Associate Attorney
No. of Claims Allowed 43 Print Claims 1 in O. G. Class 74-108.
Title as Allowed Piston
Division of App., No. ....., filed ....., 19...

Reexam'd and passed for Issue , 19
Exr. Div.
Notice of Allowance , 19
By Commissioner.
Final Fee , 19

Slip

733 12426

($15 Rec'd Nov 30 1917 C. C. U. S. Pat. Office Ck a)

204661

Division 12, Paper No. 1
Dec 3 1917
U. S. Patent Office

PETITION

To the Commissioner of Patents:

Your Petitioner, Edward J. Gulick, residing at Elkhart, County of Elkhart, State of Indiana, and whose P. O. Address is P. O. Box 553, Elkhart, Indiana, prays that Letters Patent of the United States may be granted to him for the Improvement in Hydrocarbon Motors, set forth in the annexed specification; and he hereby appoints Milton Tibbetts, (Registration No. 5403), of the City of Detroit, County of Wayne, State of Michigan, his Attorney, with full power of substitution and revocation, to prosecute this application; to make alterations and amendments therein; to receive the patent, and to transact all business in the Patent Office, and before the

Courts, D. C., connected with the application or with the patent granted thereupon, and to do all other lawful acts and things which he if personally present could.

EDWARD J. GULICK.

SPECIFICATION

To Whom It May Concern:

Be it known that I, Edward J. Gulick, a citizen of the United States, and resident of Elkhart, Elkhart County, State of Indiana, have invented certain new and useful improvements in ~~Hydrocarbon Motors~~ **Pistons** of which the following is a specification:

204661—1
MT:MEG
12427
B-1733

SB

per H This invention relates to ~~hydrocarbon motors~~
per H ~~and particularly to~~ pistons ~~therefor.~~
Title change per C per H One of the objects of the present invention is to provide a piston which ~~is~~ will not ~~adapted to~~ expand against the cylinder wall to such an extent as to ~~seize siese~~ or stick.

per E Another object of the invention is to provide a piston with a skirt ~~or guide portion~~ slightly separated from the head of the piston and split longitudinally so that it will not expand in circumference with a force great enough to cause the piston to stick in the cylinder.

per E Another object of the invention is to provide a piston with ~~improved lubricating means for lubricating conduits leading from the exterior of the piston to~~ the piston pin bosses.

Insert H¹ Another object of the invention is to rigidly support the piston pin bosses of a piston from the piston walls. (4) H¹

Other objects of the invention will appear from the following description taken in connection with the drawings which form a part of this specification, and in which:

Fig. 1 is a longitudinal sectional view through a piston embodying the invention;

Fig. 2 is similar to Fig. 1 taken at right angles thereto, being on the line 2—2 of Fig. 3;

Fig. 3 is a transverse section substantially on the line 3—3 of Fig. 1;

Fig. 4 is a transverse section on the line 4—4 of Fig. 1;

Fig. 5 is a view similar to Fig. 1, showing a slightly different form of piston embodying the invention; and

Fig. 6 is a top view of the piston shown in Fig. 5.

Referring to the drawings, 10 represents
Per E the head **portion** of a piston and 11 is the skirt
" E **or guide portion** which is shown as separated at its periphery from the head leaving an annular slit or opening 12 therebetween. The head portion of the piston is provided with an annular groove 13 for a piston ring 14, and the upper end of the skirt **portion**
Per E 11 is formed with **a recess shown in the form of** an annular groove 15 for the purpose of collecting the oil that may be scraped from the cylinder during the reciprocation of the piston.

The piston is also provided with a pair of separated piston pin bosses 16 which are formed with integral supporting flanges 17 extending around the bosses and arranged intermediate their ends. These flanges extend laterally of their respective bosses in the form of webs 18 which integrally connect with the wall of the
Per E ~~skirt~~ **guide portion** 11 as shown in the drawings.
" E Since there are two of these webs **or walls** 18 for each of the bosses 16 there are therefore four
" E connections of the webs 18 to the skirt **or guide portion** 11. These connections are in the four longitudinal lines as shown at 19.

The flanges 17 also extend upwardly from
" E the bosses in the form of webs **or walls** 20 leading to the head 10 and thereby connecting the bosses with the head. Thus, the bosses are connected to both the head and the skirt so that the latter is held in its proper position directly beneath the head as shown in Figs. 1 and 2.

In order that the skirt may not expand an undue amount when the piston is heated, as under operating

Insert E^1 conditions, ~~it~~ **(3)** E^1 is split longitudinally as at 21. This split is slightly diagonal to prevent
Insert E^2 wearing a groove in the cylinder **(3)** E^2

Per E The piston is further provided with conduits 22 shown in the form of pipes extending from the recess or groove 15 at the upper end of the skirt to openings 23 in the bosses. There is shown one conduit for each boss and it will be understood that the oil collected in the groove 15 by the piston in its reciprocation is led down through the conduits 22 to the interior of the piston pin boss to thereby lubricate the bearing.

Insert E³ F¹ The skirt 11 is formed with openings 24 in its side registering with the openings through the bosses 16 so that the piston pin may be inserted. (7) E³-F¹

Per E " E " E " E " E Insert E⁴ It will be seen that in addition to providing a piston with a split ~~skirt~~ guide portion the above described construction also provides ~~an extremely~~ a longitudinally rigid connection between the piston pin bosses and the ~~skirt~~ guide portion of the piston, which construction may be used either with or without the split ~~skirt~~ guide portion and separated head. The arrangement of the supporting flanges 17 between the ends of the piston pin bosses and the connections of those flanges with both the piston ~~skirt~~ guide portion and the head provide a particularly strong ~~support for the bosses.~~ (5) E⁴

Per E " E " E " E Insert E⁵ In Figs. 5 and 6 the webs or walls 18 are slightly curved between the flanges 17 and the ~~skirt wall~~ guide portion to thereby distribute the connection of the bosses to the ~~skirt~~ guide portion more evenly around the ~~skirt~~ piston. Otherwise the showing is substantially the same as in the other figures. (4) E⁵

It will be understood further that my invention is not limited to the details of construction shown and other forms may be used without departing from the spirit or scope of the invention. (X)

Having this described my invention, what I claim and desire to secure by Letters Patent is:—

Per A 1. A piston comprising a head, a skirt separated at its periphery throughout its cir-

cumference from the head, and pin bosses connected to the head and to the skirt, said skirt
Per A being split longitudinally **from its upper edge to its lower edge and** at one side between its
Per E connections to said bosses.

2. A piston comprising a head, a skirt
per A separated at its periphery **throughout its circumference** from the head, and pin bosses connected to the head and to the skirt, said skirt
" A being split diagonally **from its upper edge to its lower edge** between its connections to said bosses.

1E. ~~3.~~ A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the
Per E upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.

2E. ~~4.~~ A piston comprising a head, a skirt separated at its periphery from the head, and
Per A pin bosses **integrally** connected to the head and to the upper and lower part of the skirt,
Insert A^1. **(4) A^1**

3E. ~~5.~~ A piston comprising a head, a skirt separated at its periphery from the head,
Per A and pin bosses **integrally** connected to the head and to the skirt in four longitudinal
Insert A^2 lines, **(4) A^2**

4E. ~~6.~~ A piston comprising a head, a skirt separated at its periphery from the head, and
Per A pin bosses connected to the head, and **also connected** to the skirt **both** above and below
Insert H^3 the bosses, **(2) H^3**
per H **5E.** ~~7.~~ ~~A~~ **An integrally cast** piston comprising a head, a skirt separated at its pe-
" A riphery from the head, and pin bosses **integrally** connected to the head and to the skirt at both sides and in the zone of said bosses,
Insert A^3 **(2) ~~H~~ A^3** **(over)**

1092870 8. A piston comprising a head, a skirt,
Per A piston pin bosses, and connections from the bosses to the head and skirt, substantially as described.

Per H

6E. ~~8a. 9. A~~ **An integrally cast** piston comprising a head, a skirt, separated piston pin bosses within the skirt, and an integral flange on each of said bosses intermediate its ends, said flange extending from both sides of the boss to the piston skirt and integrally united therewith in the zone of the boss, (2)

Insert H⁴

~~H⁴~~.

Per H

7E. ~~9a. 10.~~ A piston comprising a head, a skirt, separated piston pin bosses **integral with the head and disposed** within the skirt, and integral ~~means~~ **transversely flexible webs** extending from the intermediate part of each of said bosses to the skirt wall in the zone of the boss for supporting the bosses from the adjacent part of the skirt.

Stabel

10a. ~~11.~~ A piston comprising a head and skirt, said skirt having an annular groove, pin bosses within the piston, and means for

Per A

conveying oil from said **exterior** groove to

Per B

said bosses.

" A

11a. ~~12.~~ A piston comprising a head and skirt, said skirt having an annular **exterior**

" A

groove, pin bosses within the piston, **spaced from the wall of the skirt** and ~~a conduit~~ **pipes** leading from said groove to the interior of said bosses.

" A

8E. ~~10B. 12a. 13.~~ A piston comprising a head, a skirt having its periphery separated from the head, pin bosses in the piston **spaced from the wall of the skirt** and conduits leading from the top of said skirt to the interior of said bosses.

Insert A⁴

Per A

9E. ~~11B. 13a. 14.~~ A piston comprising a head, a skirt having its periphery separated from the head, pin bosses in the piston (2) **A⁴** means **integrally** connecting the bosses with the head and skirt, and ~~a conduit~~ **pipes** leading from the upper part of the skirt to the bosses.

10E. ~~12B. 14a. 15.~~ A piston comprising a head, a skirt, separated piston pin bosses within the skirt, and an intermediate flange on each of said bosses intermediate its ends, said flange extending laterally from both

sides of the boss to the piston skirt in a curve and integrally united with the skirt in the zone of the boss.

Insert C[1] (X)

6. 204661—6

12432

In testimony whereof I affix my signature.

EDWARD J. GULICK.

OATH

COUNTY OF ELKHART,
STATE OF INDIANA, ss.

EDWARD J. GULICK, the above named petitioner, being sworn or affirmed, deposes and says that he is a citizen of the United States, and resident of Elkhart County, State of Indiana, that he verily believes himself to be the original, first, and sole inventor of the Improvement in HYDROCARBON MOTORS described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvement has been filed by him or his representatives or assigns in any country foreign to the United States.

EDWARD J. GULICK.

Sworn to and subscribed before me this 23rd day of November, 1917.

WARD A. BERNET,

(Notarial Seal) *Notary Public.*

My commission expires May 4, 1921.

204661—7

(Patent Office Apr 2 1918 Mailed)
2-260 Z/h

Div. 12 Room 322 Paper No. 2

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington, April 2, 1918.

Milton Tibbetts,
C/o Packard Motor Car Company,
Detroit, Michigan.

Please find below a communication from the EXAMINER in charge of the application of E. J. Gulick, for Hydrocarbon Motors, filed November 30, 1917, Serial Number 204,661.

JAMES T. NEWTON,
Commissioner of Patents.

This case has been examined.

The title of invention should be changed to one more suggestive of the actual improvement, such as "Pistons," "Hydrocarbon Motor Pistons," etc.

Claims 1 and 2 are rejected on the patent to—

Spillman, et al, 1,092,870, April 14, 1914, (74-85),

in view of it being old to split the skirt of a piston in the manner such as shown by the patent to—

Schoengarth, 1,174,092, March 7, 1916, (74-85).

Claims 6 and 8 are rejected on the patent to Spillman, supra.

Claims 11 and 12 are rejected on the patent to Spillman, supra, in view of the oil conduits shown by—

Nichols, 953,389, March 29, 1910, (74-85).

Claims 3, 4, 5, 7, 9, 10, 13, 14, and 15, are allowable as at present advised.

L

C. A. SAUL,

B.V.Z. *Exr Div. 12.*

204661—8

(Patent Office Sep 16 1918 Mailed)

2-260

Div. 12 Room 322. Paper No. 3

Address only
"The Commissioner of Patents,
Washington, D. C.,"
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MWY

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, Sept. 16, 1918.

Milton Tibbetts,
c/o Packard Motor Car Co.,
Detroit, Mich.

Please find below a communication from the EXAMINER in charge of the application of Edward J. Gulick, Ser. No. 204,661, filed Nov. 30, 1917; Hydrocarbon Motors.

JAMES T. NEWTON,
Commissioner of Patents.

Supplementary to the Office action of April 2, 1918.

Claims 4 and 7 are believed to be too broad in view of newly discovered references.

These claims are rejected on the patent to

Haas 1,229,258 June 12, 1917 (121-104) in view of British to Birmingham Small Arms Co., 21,435 Sept. 15, 1910 1 sheet 74-85. There would be no novelty in

duplicating the pin boss webs "17" of Haas so as to connect with the lower part of the skirt in view of the webs shown by Birmingham et al.

Claims 4 and 5 are further rejected on British patent to

Thomas 1411 June 13, 1914 1 sheet.

Claims 13 and 14 are rejected on Haas supra in view of Nichols of record. There would be no invention in making an oil conduit as shown by Nichols for the skirt of the Haas piston leading to the boss bearing.

A. B. REAVIS,
Actg Examiner, 12.

B.V.Z. 204661—9

12433

(Mail Room Jul 26 1919 U. S. Patent Office)
Division 12, Paper No. 4
A Jul 28 1919
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

Edward J. Gulick,
Hydrocarbon Motors,
Filed November 30, 1917.

Room 322
Div. 12
Serial No. 204,661

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

This application is amended as follows:

In the preamble of the specification change the title of the invention from "Hydrocarbon Motors" to —*Hydrocarbon Motor Pistons*—.

Claim 1, line 2, after "periphery" insert —*throughout its circumference*—; line 3, after "longitudinally" insert —*from its upper edge to its lower edge and*—.

Claim 2, line 2, after "periphery" insert —*throughout its circumference*—; line 3, after "diagonally" insert —*from its upper edge to its lower edge*—.

Claim 4, line 2, after "bosses" insert —*integrally*—; line 3, after "skirt" change the period to a comma and insert —*the outer ends of the pin bosses being*

A[1] Insert H[2] *spaced from the opposing parts of the skirt wall and said skirt having openings opposite the open ends of the bosses*—, (2) H[2]

Claim 5, line 2, after "bosses" insert —*integrally*—; line 3, after "lines" change the period to a comma and insert —*the ends* A[2] *of said bosses being spaced from the opposing parts of the wall of the skirt, said skirt hav-*

ing openings therethrough opposite the open ends of the bosses—.

Claim 6, line 3, after "head" insert a *comma* and after "and" insert —*also connected*—; same line, after "skirt" insert —*both*—.

Claim 7, line 2, after "bosses" insert —*integrally*—; line 4, after "bosses" change the period to a A[3] comma and insert —*the bosses having their* Insert H[3] *ends spaced from the opposing parts of the skirt wall*—, (2) H[3]

Cancel claim 8.

Change the numbers of claims 9 and 10 to 8 and 9 respectively.

Change the number of claim 11 to 10 and in line 3 thereof before "groove" insert —*exterior*—.

Change the numeral of claim 12 to 11 and in line 2 thereof before "groove" insert —*exterior*—, and after "piston" cancel the comma and insert —*spaced from the wall of the skirt*—; line 3, cancel "a conduit" and insert —*pipes*—.

Change the numeral of claim 13 to 12 and in line 2 thereof after "piston" cancel the comma and insert —*spaced from the wall of the skirt*—;

Change the numeral of claim 14 to 13 and in line 2 thereof after "piston" cancel the comma and insert —*the ends of said bosses being spaced from the* A[4] *walls of the skirt*—; line 3, after "means" insert —*integrally*—; lines 3-4, cancel "a conduit" and insert —*pipes*—.

Change the number of claim 15 to 14.

REMARKS

The splitting of the skirt cooperates with the peripheral separation of the skirt from the head to perform a unitary function, namely that of permitting sufficient

contraction and expansion of the skirt without seizing. In the Schoengarth patent there is no separated skirt, and hence there can be no definite relation between such a skirt and a split or weakened formation therein. In applicant's case the split runs entirely through the skirt, and hence there is a capacity for continuous yielding throughout the entire length of the same. There is clearly a true combination between the split and the other form of division consisting of the peripheral separation of the skirt from the head, and hence the subject matter of claims 1 and 2 as now amended is not met by Spillman and Schoengarth taken together.

In regard to the subject matter of claims 4, 5 and 7, the Haas patent does not show the pin bosses integrally connected to the head and to the skirt. In all the forms shown by Haas the head, or part of the head, is separate from the skirt and connected thereto by screws or bolts. Nor does Haas show the bosses spaced at their ends from the wall of the skirt.

The British patent to Birmingham does not show the spaced piston bosses.

The British patent to Thomas does not show the pin bosses integrally connected to the head and does not have the openings in the skirt opposite the open ends of the bosses.

In respect to the subject matter of original claims 11 to 14 inclusive, Spillman does not have the exterior groove for receiving the oil, but an inwardly inclined edge 14 which serves to deflect the oil back into the piston and does not serve to collect the same so that it may be led from the groove through conduits down into the bosses, nor does Nichols show the pipes provided in the

body of the piston, but, on the contrary, merely has channels cut through the ordinary piston wall.

Nor does the Haas patent disclose anything more pertinent to this oiling arrangement than the Spillman patent, even when taken in connection with Nichols.

Respectfully submitted,

EDWARD J. GULICK.
By MILTON TIBBETTS,
His Attorney.

Detroit, Michigan,
July 24, 1919,
HPD:MH

4. 204661—13

(Patent Office Nov 15 1919 Mailed)
2—260

Div. 12 Room 322 Paper No. 5

Address only
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All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

Z/D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington, November 15, 1919.

Milton Tibbetts,
c/o Packard Motor Car Co.,
Detroit, Michigan.

Please find below a communication from the Examiner in charge of the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, Hydrocarbon Motor Pistons.

JAMES T. NEWTON,
Commissioner of Patents.

Responsive to the amendment of July 26, 1919.

Claims 1 and 2 are rejected upon either the patent to Spillman, of record or the French patent to

Chenard, 468,595, (1 sheet) (74-108)

especially in view of either the patent to Schoengarth, of record or the French to

Panhard, 480,650, (1 sheet) (74-108A).

Claims 3, 4 and 7 are rejected upon the patent to Spillman, supra, in view of the British patent to

Ricardo, 17,953, Dec. 23, 19165 (74-108).

Claim 6 is rejected upon the patent to Ricardo, supra.

Claims 10 and 11 are rejected upon the patent to

Stabel, 753,527, Mar. 1, 1904 (74-108L).

Claims 5, 8, 9, 12, 13 and 14 are allowable.

P. P. PIERCE,
Examiner.

B.V.Z.

204661—14

(Mail Room Sep 24 1920 U. S. Patent Office)
Division 12, Paper No. 6
Sep 25 1920
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

Edward J. Gulick, Room 332
Hydrocarbon Motors, Div. 12
Filed November 30, 1917. Serial No. 204,661

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In response to the Office Action of November 15, 1919, please amend the above entitled application as follows:

B

Cancel claims 10 and 11 and renumber the remaining claims.

REMARKS

Reconsideration is respectfully requested for claims 1 to 3 inclusive since the references cited by the Examiner do not disclose the inventions set forth. In each of these claims is defined a piston, comprising a head, a skirt separated at its periphery throughout its circumference from the head, and pin bosses connected to the head and to the skirt, said skirt being split longitudinally at one side between its connections to said bosses.

In addition to this description claims 1 and 2 specify that the skirt is split diagonally from its upper edge to its lower edge. Claims 1 and 2 are rejected on Spillman or the French patent to Chenard in view of Schoengarth or the French patent to Panhard. The Spillman patent discloses merely a piston having its head and skirt separated at the periphery of the head and bosses connected

to the head and to the skirt, and this is also true of the French patent to Chenard.

The patent to Schoengarth discloses a piston having a head and skirt connected together at the periphery of the skirt, or in other words, formed in one piece, and this patent also has a pair of slots, 3 and 4, the slot 3 being cut into the skirt of the piston from the side toward the longitudinal center, and the slot 4 being cut diagonally from the junction of the slot 3 with one of the walls to the lower end of the skirt. From the specification of Schoengarth we learn that these slots were formed merely for the purpose of providing an adjustment whereby the circumference of the skirt could be varied and this adjustment is secured by means of the screws or studs, 5 and 5'. It is evident, therefore, that the diagonal slot 4 could not function in the manner of applicants diagonal slot 21, and that the patentee had no such object in mind in providing the slot 4.

The French patent to Panhard shows a piston construction in which there appears to be provided a longitudinal slot reaching from one end of the piston to the other, but it is not understood how this piston could operate in the manner illustrated, since the slot would apparently permit a leakage of gas past the piston. In the Panhard patent, there is not disclosed a piston made up of a head and a skirt separated from the head.

From the above outline of the patents cited against these claims, it is evident that no one of the patents dis-

closes the combination claimed, and it is also evident that the object of the invention could not be attained without the use of all the elements of the combination, namely

the head, the skirt separated from the head at its periphery, the bosses connected to the head and to the skirt, and the slot extending throughout the length of the skirt. For these reasons it is respectfully submitted that all the elements combine to form a true combination, and that none of the patentees had in mind the accomplishment of the object for which applicant's device was designed. It is believed, therefore, that claims 1, 2 and 3 inclusive are allowable.

It is noted that the Examiner rejected claim 3 on the Spillman patent taken with the British patent to Ricardo, but this rejection appears to have been inadvertent, or based upon a misunderstanding of the scope of the claim, since neither Spillman nor Ricardo discloses the piston having the skirt split longitudinally. For this reason it has been assumed that claim 3 should have been grouped with claims 1 and 2, and therefore this claim was discussed in connection with the preceding claims.

In connection with the citation of the British patent to Ricardo, attention is called to the fact that the pin bosses are not connected to the head and to the skirt as in applicant's construction, and as set forth in the claim, but in Ricardo the pin bosses are connected to a downwardly extending portion "B" formed integrally with the head "A" and the skirt "E" is bolted to this same portion "B."

Reconsideration is respectfully requested for claims 4 and 7, rejected on Spillman and on Ricardo, and since claim 4 calls for pin bosses integrally connected to the head and to the upper and lower part of the skirt and

claim 6 calls for the pin bosses connected to the head and also connected to the skirt both above and below the bosses. As above pointed out the bosses "F" in Ricardo are not connected to the skirt, and in the Spillman patent the bosses are not connected to the upper and lower portions of the skirt, and are not connected to the skirt both above and below the bosses. For these reasons it is believed that claims 4 and 6 are allowable.

Claim 7 distinguishes from the patents to Spillman and Ricardo, for the reasons pointed out in connection with claim 4.

Former claims 10 and 11 have been cancelled since the subject matter of these claims appeared to be sufficiently covered in the claims which were retained.

The above amendment is believed to be fully responsive to the last Office Action, and a favorable Action is respectfully requested.

Respectfully submitted,

EDWARD J. GULICK,
By MILTON TIBBETTS,
His Attorney.

Detroit, Michigan
Sept. 21, 1919,
LWH-KB

—4— 204661—18

(Patent Office Nov 19 1920 Mailed)
2—260

Div. 12 Room 322 Paper No. 7

Address only
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Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington, Nov. 19, 1920.

Milton Tibbetts,
c/o Packard Motor Car Co.,
Detroit, Mich.

Please find below a communication from the Examiner in charge of the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, Hydrocarbon Motor Pistons.

R. F. WHITEHEAD,
Commissioner of Patents.

Responsive to the amendment of Sept. 24, 1920.

Claims 1 to 3 inclusive are again rejected on Spillman et al, of record, in view of

Spillman, 1,325,176, Dec. 16, 1919 (74-108-A).

It is common in the art to split the skirt of a piston longitudinally for the purpose of allowing the same to expand against the walls of the cylinder by the application of heat.

Claims 4, 6 and 7 are rejected as being met in terms by

Ricardo, 1,294,833, Feb. 18, 1919 (74-108).

The remaining claims are allowable.

P. P. PIERCE,

V.I.C. *Ex.*

204661—19

12437

(Mail Room Oct 29 1921 U. S. Patent Office)

Division 12, Paper No. 8
Oct 31 1921
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

3 yrs ent Cl.
Edward J. Gulick Room No. 322
Hydrocarbon Motor Pistons Division No. 12
Filed November 30, 1917 Serial No. 204,661
not ent

Hon. Commissioner of Patents,
Washington, D. C.

C

Sir:—

This application is amended as follows:

In the preamble please change the title from "Hydrocarbon Motor Pistons" to —*Pistons*—.

Page 2, line 4, change "is not adapted to" to —*will not*—.

Add the following claims:

—13. A piston comprising integral head and skirt portions, said piston being formed with a transverse slit

near its upper end and with a **longitudinally**
Per D **~~diagonally~~** extending slit running from the transverse slit to the free end of the piston skirt,
C adjacent parts of the skirt across said **longitu-**
Per D **dinal ~~diagonal~~** slit being entirely disconnected to permit free expansion and contraction of the skirt parts.

merely integral as Spillman
Per E

14. A piston comprising integral head and skirt portions, said piston being formed with a transverse slit extending entirely around the piston near its
Per D upper end and with a **~~diagonally~~ longitudinally** extending slit running from the transverse slit to the free end of the piston skirt, adjacent parts
" D of the skirt across said **longitudinal ~~diagonal~~** slit being entirely disconnected to permit free expansion and contraction of the skirt parts.

15. A piston comprising integral head and skirt portions, said piston being formed with a transverse slit near its upper end and with a **~~diagonally~~**
Per D **longitudinally** extending slit running from the

transverse slit to the free end of the piston skirt, adjacent parts of the skirt across said **~~diagonal~~**
Per D **longitudinal** slit being entirely disconnected to permit free expansion and contraction of the skirt parts, and piston pin bosses formed as an integral part of the piston.

16. A piston comprising a head having a ring adapted to contact with the cylinder wall,
Per D a skirt having a **longitudinally ~~diagonally~~** extending slit permitting it free expansion and contraction, and means integral with the head and the skirt connecting the head with the skirt and arranged to be out of contact with the cylinder wall in the operation of the piston.
Per E

17. A piston comprising a head having a ring adapted to contact with the cylinder wall,
Per D a skirt having a **longitudinally ~~diagonally~~** extending slit permitting it free expansion and contraction, and means integral with the head and the skirt connecting the head with the skirt and arranged to be out of contact with the cylinder wall in the opera-

tion of the piston, and piston pin bosses formed in said connecting means.

Per D 18. A piston comprising a head having a ring adapted to contact with the cylinder wall, a skirt having a **longitudinally** ~~diagonally~~ extending slit permitting it free expansion and contraction, and means integral with the head and the skirt connecting the head with the skirt and arranged to be out of contact with the cylinder wall in the operation of the piston, and piston pin bosses formed in said connecting means, the outer ends of said bosses being slightly inside the normal diameter of the piston skirt.

C' **11E** ~~19~~. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the

bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated

Per E from the head portion except through the boss connections, and the skirt portion being ~~slit~~ **split** longitudinally of the piston to permit free expansion and contraction.

C' contd **12E**. ~~20.~~ A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated

Per E from the head portion except through the boss connections, and the skirt portion being ~~slit~~ **split** longitudinally of the piston to permit free expansion and contraction and the skirt portion being cut away adjacent the outer ends of the piston bosses.

13E. ~~21.~~ A piston having a head portion with a ring groove therein, a skirt portion having its cylinder ~~contact~~ **engaging** part separated

Per E from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the

" E head portion respectively, said skirt being ~~slit~~ **split** from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

Insert E' Cls 14-29

D'

REMARKS.

Reconsideration of this application in its present form is respectfully requested.

Claims 1, 2 and 3 are rejected on Spillman 1,092,870 *in view of* Spillman 1,325,176. Attention is called to the fact that the application for the later Spillman patent was filed February 12, 1919 whereas applicant's case

3. 204661—22

12440

was filed November 30, 1917. Under these circumstances the later Spillman patent is, of course, no reference and must be withdrawn and since these claims are admittedly not met in the earlier Spillman patent alone these claims should be allowed.

Claims 4, 6 and 7 are rejected on Ricardo 1,294,833 the application for which was filed April 23, 1918. Applicant's case was filed November 30, 1917 so that Ricardo is no reference against him. It is requested that this Ricardo patent also be withdrawn as a reference.

Several new claims have been inserted which clearly differentiate from all of the valid references cited and allowance of these claims is also requested.

Respectfully submitted,

EDWARD J. GULICK,
By MILTON TIBBETTS,
His Attorney.

Detroit, Mich.
October 26, 1921
MT:TS

4. 204661—23

(Mail Room Dec 23 1921 U. S. Patent Office)

A & Affidavit
Division 12, Paper No. 9
Dec 24 1921
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

Edward J. Gulick
Pistons
Filed November 30, 1917

Room No. 322
Division No. 12
Serial No. 204,661.

Hon. Commissioner of Patents,
Washington, D. C.

D

Sir:—

In addition to the amendment filed October 29, 1921, this application is hereby further amended as follows:

Claims 13, 15, 16, 17 and 18, line 3, and claim 14, line 4, change "diagonally" to *—longitudinally—*.

Claims 13, 14 and 15, line 6, change "diagonal" to *—longitudinal—*.

Add the following claims:

do 1 —22. A piston comprising integral head and skirt portions, the head portion having a piston ring part, said piston being slit through
D its side wall transversely and longitudinally, the transverse slit being immediately below said ring part, and the longitudinal slit extending
Per E from the transverse slit to the lower end of the skirt to allow for expansion of the skirt portion.

do 1 23. A piston comprising integral head and skirt portions, the head portion having a piston ring part, said piston being slit through its side wall transversely and longitudinally, the transverse slit being immediately below said ring part and extending entirely around the piston, and the longitudinal slit extending from the transverse slit to the lower end of the skirt to allow for expansion of the skirt portion.

do 1 24. A piston comprising integral head and skirt portions, the head portion having a piston

204661—24

ring part, said piston being slit through its side wall transversely and longitudinally, the transverse slit being immediately below said ring part, and the longitudinal slit extending from the transverse slit to the lower end of the skirt to allow for expansion of the skirt portion, adjacent parts of the skirt across the longitudinal slit being entirely disconnected to permit free expansion and contraction of the skirt portion.—

REMARKS

A patent relating to this art which has not been cited up to this time is the patent to Franquist, No. 1,153,902, dated September 21, 1915, and claim 22, here-

inabove, is designed to distinguish from the Franquist construction by reason of the transverse slit being arranged below the piston ring part of the piston. It will be noticed that in Franquist, particularly in Figs. 1 and 2, that the slit 17 which extends part way around the piston is at the base of the lower piston ring slot or groove. This would cause the piston skirt to expand upwardly and tend to close the ring groove and thus interfere considerably with the operation of that particular piston ring. In applicant's construction the transverse slit is entirely below the ring portion of the piston and that feature is brought out in claim 22. Since applicant is the first to use the transverse and longitudinal slits in which the transverse slit is below the piston rings, he should be entitled to this claim.

Claim 23 is similar to claim 22 except that it is limited by calling for the transverse slit extending entirely around the piston. Claim 22 would cover pistons slotted only partly around their circumference.

In order to anticipate the Examiner's rejection of claim 22 on the patent to Schoengarth, cited, we are filing herewith an affidavit of the applicant carrying his date of invention back of the filing date of Schoengarth. Applicant made this invention and made some of these pistons and successfully used them before Schoengarth filed, so that Schoengarth is no longer a reference.

Claim 24 is similar to claim 22 except that the adjacent parts of the skirt across the longitudinal slit are referred to as being entirely disconnected, which is not true of Schoengarth. This claim, therefore, is allowable regardless of the patent to Schoengarth as a reference.

Respectfully submitted,

EDWARD J. GULICK,
By MILTON TIBBETTS,
His Attorney.

Detroit, Michigan
November 29, 1921
MT:TS

(Mail Room Dec 23 1921 U. S. Patent Office)

IN THE UNITED STATES PATENT OFFICE

Edward J. Gulick
Pistons
Filed November 30, 1917

Room No. 322
Division No. 12
Serial No. 204,661

AFFIDAVIT

County of Elkhart } ss.
State of Indiana }

Edward J. Gulick of Elkhart, Indiana, being duly sworn, deposes and says that he is the applicant in the matter of the above entitled application, and that the following claim is a part of said application:

> 22. A piston comprising integral head and skirt portions, the head portion having a piston ring part, said piston being slit through its side wall transversely and longitudinally, the transverse slit being immediately below said ring part, and the longitudinal slit extending from the transverse slit to the lower end of the skirt to allow for expansion of the skirt portion.

that he invented the piston set forth in the above claim prior to the month of October 1915; that he made or had made under his direction drawings of said piston and described the same to others in this country prior to the month of October 1915; that a blue print of one of such drawings has been preserved and is now in the possession of the assignee of this application, the Packard Motor Car Company of Detroit, Michigan; that a photoprint of such blue print is attached hereto; that the longhand notes on said blue print which show in the photoprint were made by him on the blue print prior to the month of October 1915; that said invention was incorporated in an automobile engine and successfully operated in the

204661—27

United States prior to the month of October 1915; that he does not know and does not believe that said invention has been in public use or on sale in this country or patented or described in a printed publication in this or any foreign country for more than two years prior to his application, and that he has never abandoned the said invention.

Edward J. Gulick.

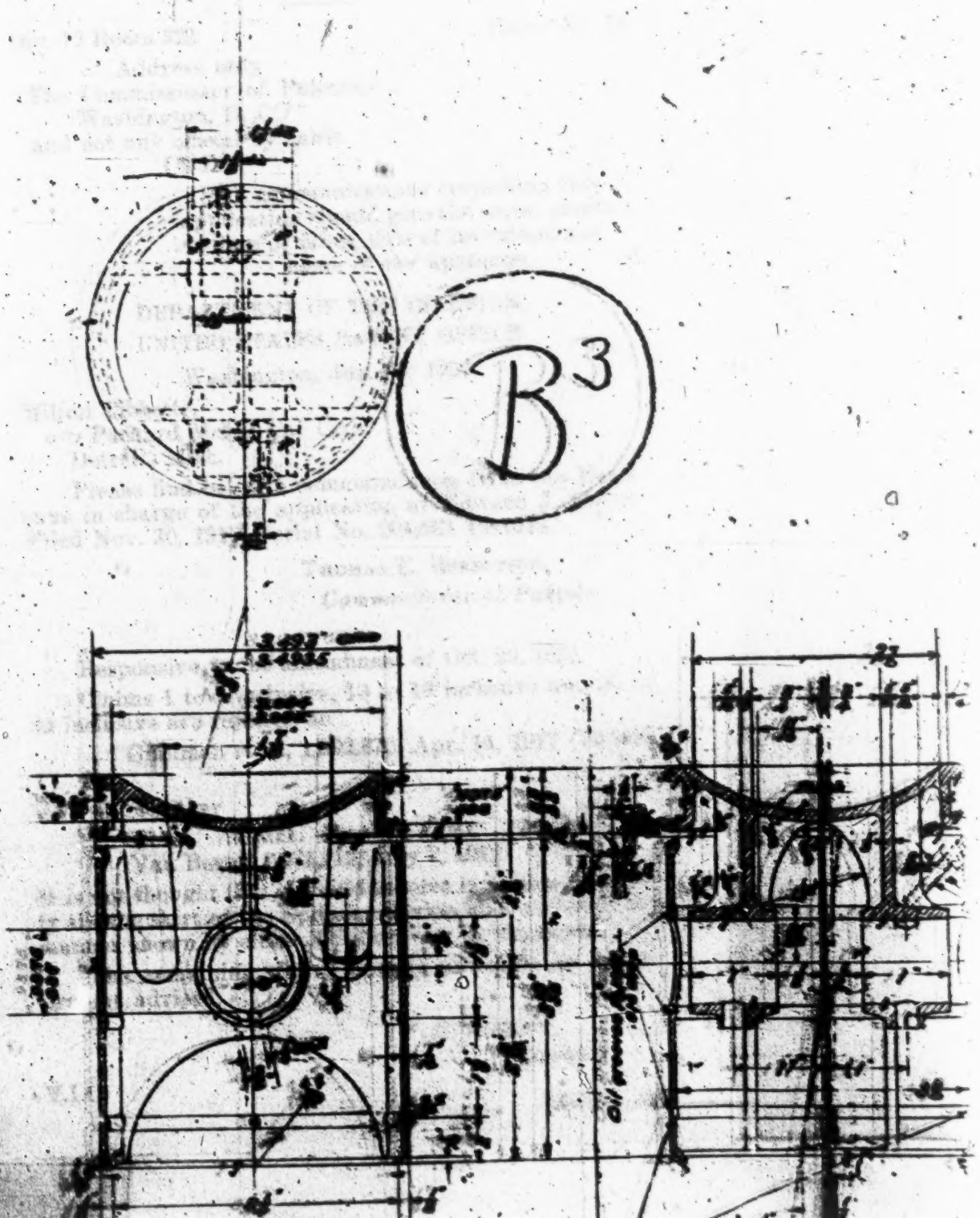
Subscribed and sworn to before me this 2nd day of December, 1921.

JOHN M. EAGLE,

(Notarial Seal) *Notary Public.*

My commission expires Mar. 7, 1922.

1861



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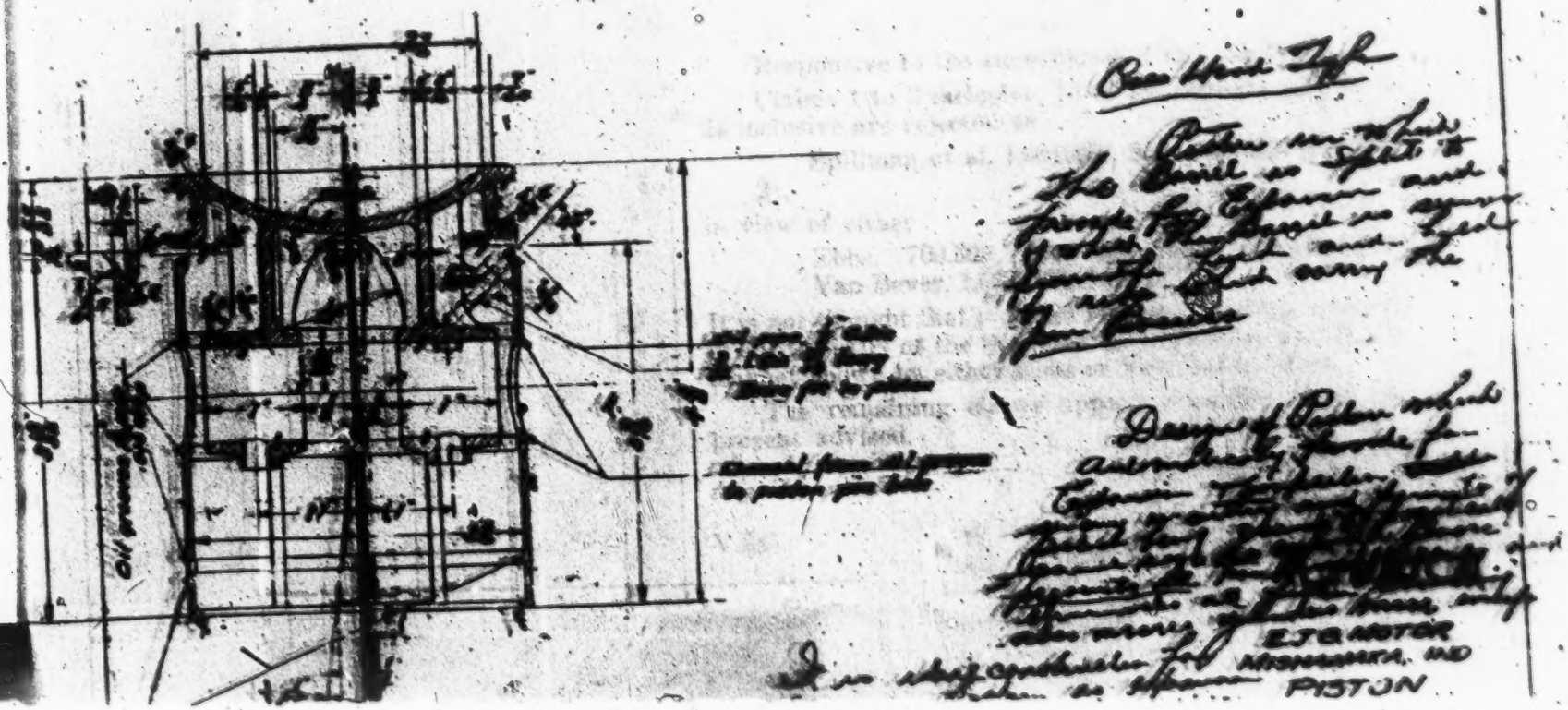

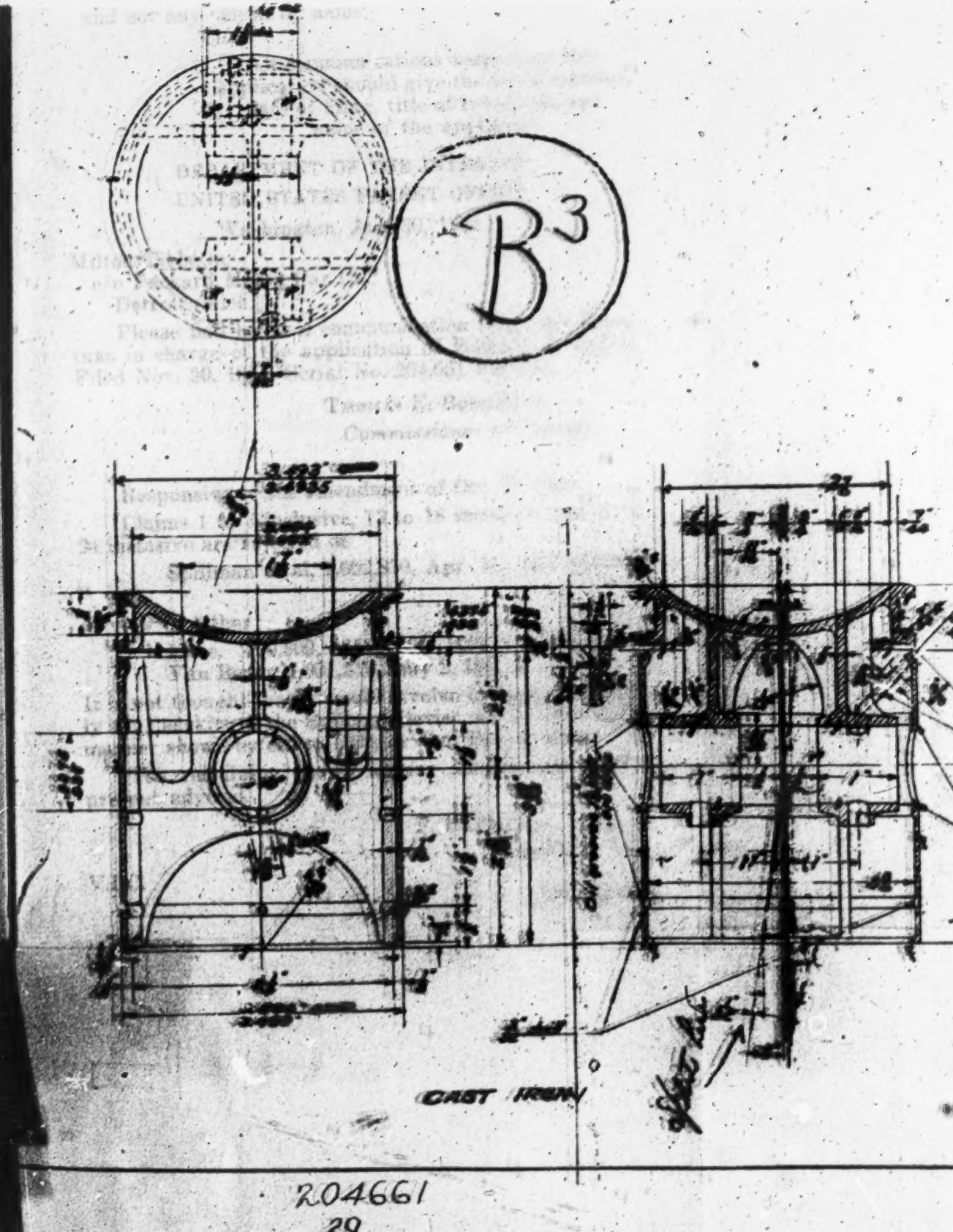

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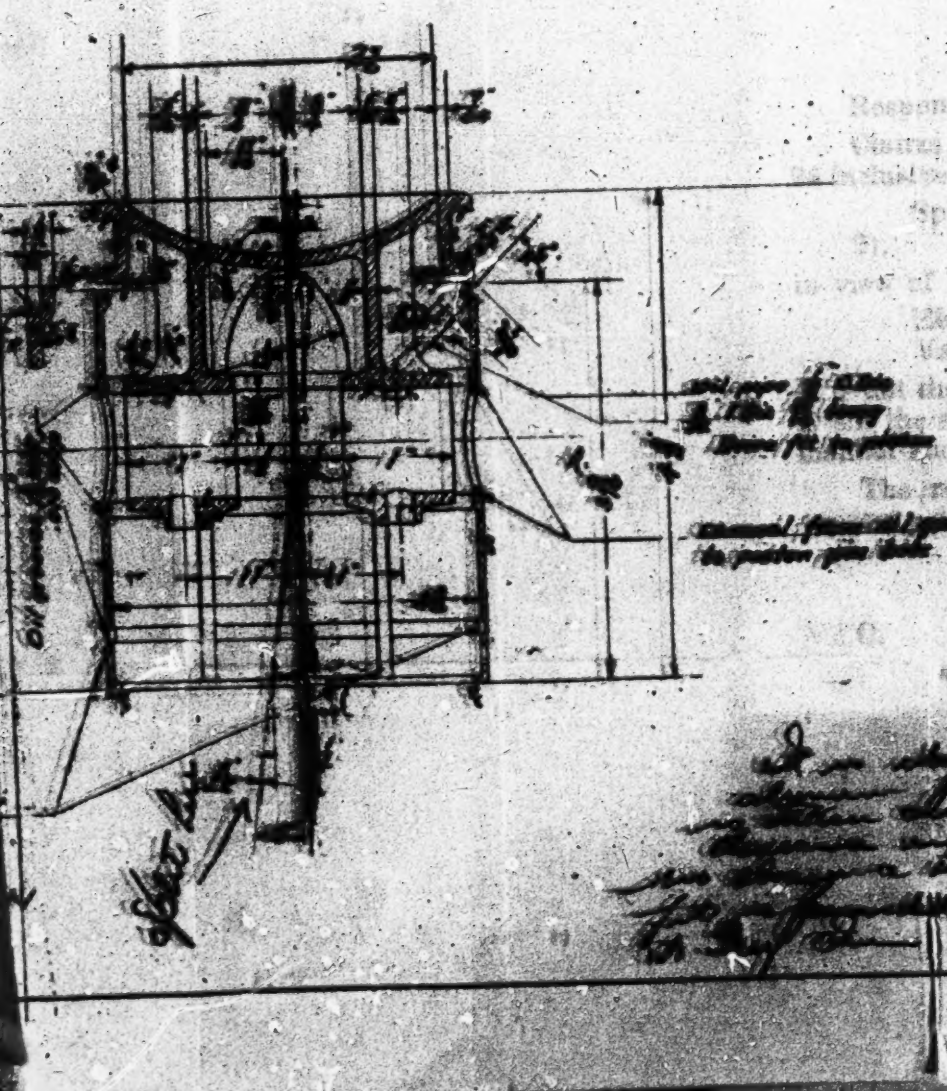

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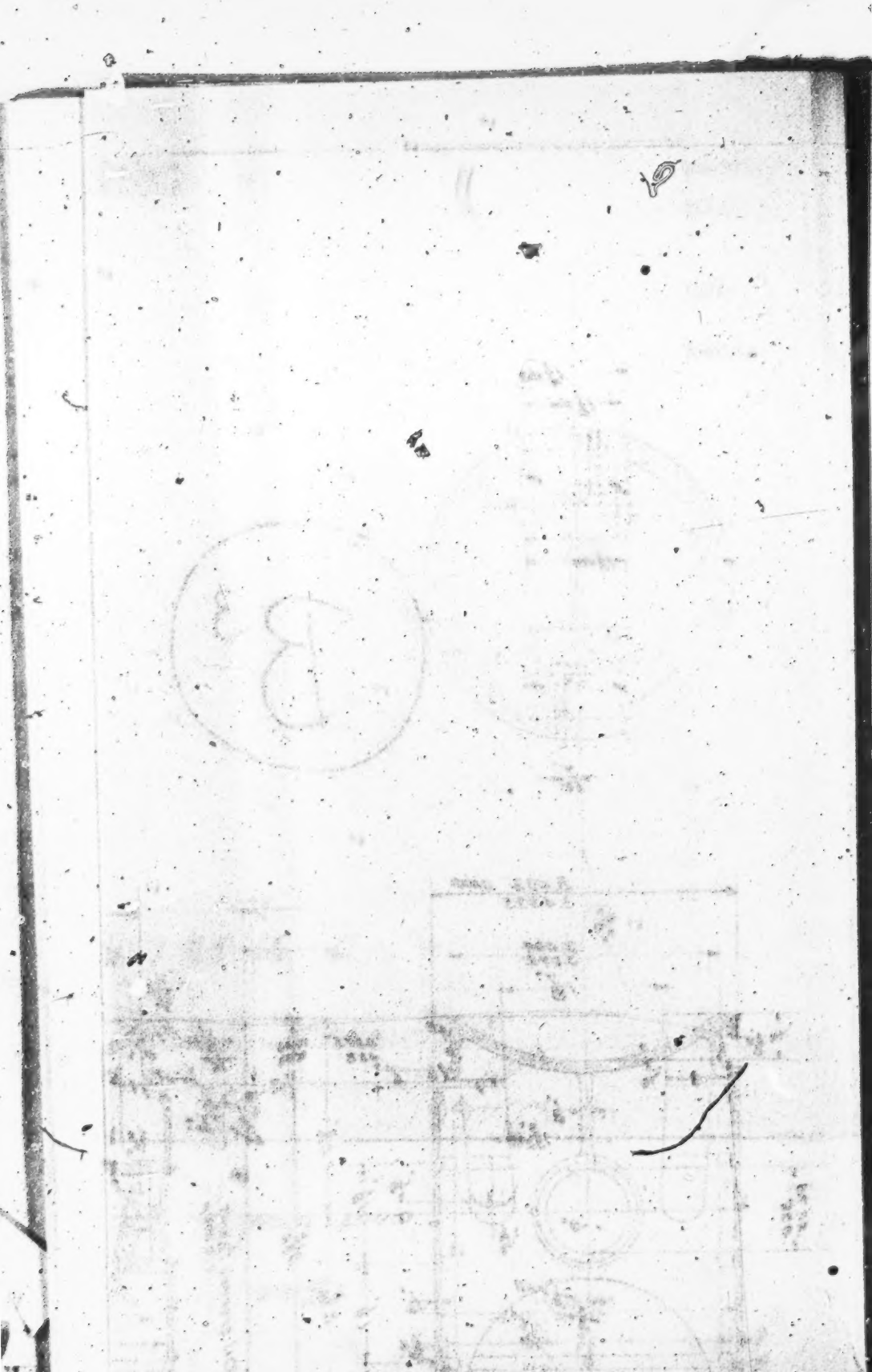

(Patent Office Jan 30 1922 Mailed)
2-260

Div. 12 Room 322 Paper No. 10

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.
Ch-D

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, Jan. 30, 1922.

Milton Tibbetts,
c/o Packard Motor Car Co.,
Detroit, Mich.

Please find below a communication from the EXAMINER in charge of the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661 PISTONS.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Responsive to the amendment of Oct. 29, 1921.

Claims 1 to 3 inclusive, 13 to 18 inclusive and 20 to 24 inclusive are rejected on

Spillman et al, 1,092,870, Apr. 14, 1917 (74-108-2),

in view of either

Ebbs, 700,309, May 20, 1902 (74-108-A) or
Van Bever, 1,031,212, July 2, 1912 "

It is not thought that it would involve invention to merely slit the skirt of the Spillman device, above cited in the manner shown by either Ebbs or Van Bever, supra.

The remaining claims appear allowable as at the present, advised.

P. P. PIERCE,
Examiner.

V.I.C.

204661—31

12441

(Mail Room U. S. Patent Office Sep 11 1922)

Division 12, Paper 11

IN THE UNITED STATES PATENT OFFICE

Application of
Edward J. Gulick,
Pistons,
Ser. No. 204,661,
Filed November 30, 1917.

Sep 12 1922
U. S. Patent Office
Div.-12,
Rm.-322.
Amendment E

Letter & print to C.
Amendment E

The Commissioner of Patents,
Washington, D. C.

Sir:—

In response to the Office Action of January 30th, 1922, applicant amends as follows:

On page 2 of the specification, line 7, after "skirt" insert —*or guide portion*—.

Same page, lines 12 and 13, strike out "lubricating conduits leading from the exterior of the piston to" and insert —*improved lubricating means for*—.

On page 3, line 4, after "head" insert —*portion*—.

Same page, line 5, after "skirt" insert —*or guide portion*—.

Same page, line 9, after "skirt" insert —*portion*—, and after "with" insert —*a recess shown in the form of*—.

Same page, line 17, cancel "skirt" and insert —*guide portion*.

Same page, line 18, after "webs" insert —*or walls*—.

Same page, line 20, after "skirt" insert —*or guide portion*—.

Same page, line 23, after "webs" insert —*or walls*—.

On page 4, line 1, strike out "it" and insert in lieu thereof —*the cylinder-engaging part of the guide at one side of the pin bosses which takes the angular* E¹ *thrust of the connecting rod during one stroke of the piston*—.

Same page, line 2, after "cylinder" insert —*and it effects a complete severing of the guide* E² *wall so that the separated edges of the split are*

unrestrained for movement toward and from each other—.

204661—32

Ser. No. 204,661. 12442

Same page, line 4, before "in" insert —*shown*—, and before "groove" insert —*recess or*—.

Same page, line 12, after the period, insert —*As these openings are well above the bottom of the guide portion of the piston the lower end of the piston skirt is left unbroken, except for the split 21*—.

E³ Per F

Same page, line 14, cancel "skirt" and insert —*guide portion*—.

Same page, line 15, cancel "an extremely" and insert —*a longitudinally*—.

Same page, line 16 and line 17, cancel "skirt" and insert —*guide portion*—.

Same page, line 20, after "with" insert —*both*—, and cancel "skirt" and insert in lieu thereof —*guide portion and the head*—.

Same page, line 21, cancel "support for the bosses" and insert —*construction, and at the same time, when the longitudinal split is used, as shown, the web structure has sufficient lateral flexibility to permit the split to close more or less under the action of the expansion forces incident to the heating of the piston*—.

E⁴

Same page, line 22, after "webs" insert —*or walls*—.

Same page, line 23, cancel "skirt wall" and insert —*guide portion*—.

Same page, line 24, cancel "skirt" and insert —*guide portion*—.

Same page, line 25, cancel "skirt" and insert —*piston*—.

Same page, after line 26, insert the following:

—*while my piston is, of course, adapted for use in either vertical, inclined, or horizontal engines, for convenience I refer in some instances to its head end and its open end as the upper and lower ends or parts, respectively*—.

E⁵

Cancel Claims 1 and 2.

Renumber Claim 3 as 1 and in line 3 change "part" to —*parts*—.

Ser. No. 204,661. 12443

Renumber Claims 4 to 12, inclusive, as 2 to 10, inclusive.

Cancel Claims 13 to 18, inclusive.

Renumber Claim 19 as 11, and in line 8 thereof, change "slit" to —*split*—.

Renumber Claim 20 as 12, and in line 8 thereof, change "slit" to —*split*—.

Renumber Claim 21 as 13, and in line 2, change "cylinder contact" to —*cylinder-engaging*—.

Same claim, line 6, change "slit" to —*split*—.

Cancel Claims 22, 23 and 24.

Insert the following claims:

—14. A piston for internal combustion engines comprising in combination a head portion having an end wall and a ring-packed side wall, a guide portion having (1) H[3] diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall of the head portion by an unobstructed air gap, a pair of separated pin bosses disposed on an E[3] axis between said cylinder-engaging parts, a pair of longitudinally disposed walls connected to said bosses and each joined at relatively widely separated points to the said cylinder-engaging parts above and below the plane of the boss axis, said walls being disposed within the maximum diameter of the piston, and integral, rigid connections extending from the bosses to the head portion.

Insert H[3] Per I

Per F E[3]

Per H

15. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

Ser. No. 204,661.

16. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air gap and one of said cylinder-engaging parts being split longitudinally from its upper edge to its lower edge, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, and walls integrally uniting said bosses, the guide portion and the head portion, (2)

Per I

Per I E^{s} contd

Per F

Insert H^{s}

17. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and arcuate cylinder-engaging parts ~~constituting unbroken continuations of~~ joining said diametrically opposite parts at the lower end of the guide, the said diametrically opposite parts each being separated at its upper end from the side wall of the head section by an air gap, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of transversely flexible walls integrally ~~walls~~ connected to said bosses and integrally joined to the cylinder-engaging parts at points above and below the plane of the boss axis, said walls being disposed within the maximum diameter of the piston, and connections extending from the bosses to the head portion and integral therewith. (Cl 18)

Per I

per F E^{s}

Per F

H

Per H

Per H

18. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts and arcuate cylinder-engaging parts ~~constituting unbroken continuations of~~ joining said diametrically opposite parts at the lower end of the guide, the said diametrically opposite parts each being separated at its upper end from the side wall of the head

Sub H^{s} Per F

section by an air gap and one of said parts being split longitudinally from its upper edge to its lower
Per F edge, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of walls connected to said bosses and joined to the cylinder-engaging parts at points above and below

the plane of the boss axis, said walls being disposed within the maximum diameter of the piston, and connections extending from the bosses to the head portion.

---

19. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having
E⁶ contd diametrically opposite cylinder-engaging
Per I parts thereof designed each separated at
Per F its upper end from the said side wall by
Insert F² an air gap, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of walls connected to said bosses and joined to the said cylinder-engaging parts at points above and below the plane of the boss axis, and rigid,
Per H integral connections between the bosses and the
Per F head ~~end~~ portions comprising upward
E⁶ extensions of said walls with strengthening ribs disposed substantially at right angles thereto.

20. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof de-
Per I signed to take the angular thrust of a connecting rod and each separated at its upper
Insert H' end from the said side wall by an air gap (2) H' ~~and~~ one of said cylinder-engaging parts being split longitudinally from its upper edge
Per H to its lower edge between said supporting connections, pair of separated pin bosses disposed
Per F on an axis between said cylinder-engaging parts, a pair of walls disposed within the
Per H maximum diameter of the piston and integrally connected to said bosses and to said cylinder-engaging parts and to said head portion.

21. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diamet-

rically opposite cylinder-engaging parts thereof
Per I designed to take the angular thrust of a connecting rod and each separated at its upper end from the said wall by an air gap and one of said cylinder-engaging parts being split longitudinally from its upper edge to its lower edge, a pair of separated
Per F pin bosses disposed on an axis between said cylinder-engaging parts, and walls integrally uniting said bosses, the guide portion and the head portion, the guide structure and said walls being adapted to permit the split of the cylinder-engaging part to close

more or less under the action of forces incident
Per H to the heating of the piston during operation.

22. A piston comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically op-
Per I posite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air gap, a pair of
Per F separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of walls connected to said bosses and to said cyl-
E⁶ contd inder-engaging parts, and connections extending from the bosses to the head section, one of the said cylinder-engaging parts being split longitudinally between the points of attachment thereto of the said walls.

23. In a piston, the combination of a head portion having an end wall and a side wall, a guide portion, a pair of separated piston pin bosses connected to the head portion, and webs disposed longitudinally of the piston integrally joining the inner parts of said bosses to the guide portion in the zone of said bosses.

24. A piston for internal combustion engines comprising a head portion, a guide portion, a pair of separated pin bosses connected to the head portion and arranged within the maximum diameter of the piston whereby the outer ends of the bosses will be out of contact with the cylinder wall, and a flange on each of said bosses near its inner end extending laterally from both sides of the boss to the guide portion in a curve and integrally united with the guide portion in the zone of

the boss, said flange being disposed longitudinally of the piston.

Sub F¹ (Cls 25-27)

Nichols views of Marcil

25. A piston for internal combustion engines comprising a head portion, a guide portion, a pair of separated pin bosses having their outer ends within the maximum diameter of the piston, each of said bosses having a passage extending entirely through its wall, and means including a recess cooperating with said passage for collecting lubricant and conducting it to the interior of the boss.

—6— 204661—37

Ser. No. 204,661. 12447

Unwarranted

26. A piston having a solid end portion and a T-shaped slot formed in the peripheral face of the piston in which the transverse portion of said T-shaped slot is disposed adjacent the solid end of the piston, said slot forming adjacent disconnected peripheral portions which are capable of unrestrained outward and inward movement.

F⁴ contd

---

per K

~~28. 29F. 27.~~ A one piece piston provided with a solid end portion and a skirt portion

per H²

having oppositely disposed thrust bearing faces and, said skirt portion having a longitudinally extending slot formed through the thickness of its wall, said slot extending from

per H

the rear edge of the skirt portion through one of said thrust bearing faces and forming ad-

per H

jacent disconnected parts of a thrust bearing face portions in said skirt portion which are capable of being moved inwardly or outwardly without restraint.

~~29. 30F. 28.~~ A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.—.

Insert G¹ (Cls 30-32)

The foregoing amendment has been prepared after a very careful consideration not only of the references last cited by the Examiner but of all prior art known to the applicant.

A reconsideration is respectfully asked of Claims 1, 12, and 13, previously numbered 3, 20, and 21, respectively, as it is thought that these claims were rejected improperly and possibly unintentionally.

Claim 1 specifies that the pin bosses are connected to the head and to the *upper and lower parts* of the skirt. This language is believed to clearly and patentably distinguish the claim from the prior art, indeed such distinction has been recognized by the Examiner in the allowance of Claim 4, previously numbered 6.

Claim 12 is distinguished from the references in

much the same manner by specifying "connecting flanges in the zone of the bosses - - -." In addition, Claim 12 specifies the two separated pin bosses, circumferential and longitudinal splits or slots to permit free expansion and contraction of the skirt portion, and the cutting away of the skirt portion adjacent the ends of the bosses. It is submitted that the Examiner's rejection of this claim is not justified, because the Spillman et al patent No. 1,092,870 has neither the connecting flanges in the zone of the bosses nor the longitudinal split in the skirt, and the piston of the Ebbs patent, which is designed for heavy slow moving internal combustion engines does not have the separated bosses, nor does it have a skirt portion "cut away adjacent the outer ends of the piston bosses" and, finally, the patent to Van Bever has slots 16 which provide for the adjustment of the piston skirt but do not "permit free expansion and contraction." The ring 17 of Van Bever positively prevents contraction.

Claim 13 specifies that the cylinder-engaging part is separated from the head portion and that the skirt is split "on one side only of the pin bosses to permit free expansion and contraction of the skirt portion." This construction is especially advantageous in that applicant's piston can be mounted so that the relatively light angular thrust of the connecting rod during the compression stroke is taken by the relatively weak split side of the piston guide structure whereas the much heavier angular thrust during the explosion stroke is sustained by the stronger unsplit side of the guide structure. There is no suggestion of this feature in the references.

With respect to the claims which have been cancelled and the new claims which are presented by the foregoing

amendment, applicant desires to remark that many if not all of the claims cancelled are believed to have presented subjects matter patentable over the references and have only been cancelled with a view to a clearer

and better presentation of the subjects matter in the new claims. With respect to these new claims attention is directed to the following considerations:

Claim 14 brings out the relative arrangement of the head and guide portions, the bosses, and the connecting walls or webs, and calls for an unobstructed air gap between the ring-packed side wall of the head portion and the upper edges of the active cylinder-engaging parts of the guide portion. By active cylinder-engaging part, I mean the part of the guide structure at one side of the pin bosses which is active in sustaining the angular thrust of the connecting rod. The practical merit of the structure defined by this claim has been thoroughly demonstrated in practice. The inter-connection of the head and guide portions and the bosses by the longitudinally disposed webs or walls provides a construction that is exceedingly strong in its adaptation to resist longitudinal stresses and at the same time the unobstructed air gap between the head and guide portions insures the lowest possible working temperature in the active cylinder-engaging parts of the guide.

Claim 15 brings out the provision of a guide with a cylinder-engaging part on one side that is separated by an air gap from the head portion and that is split longitudinally to accommodate expansion incident to the heating of the piston. One of the notable advantages of this construction has already been pointed out in connection with Claim 13. It may be noted, furthermore, that the patent to Ebbs, which the Examiner cited to show a slotted skirt structure, shows slots or openings between the two active cylinder-engaging parts of the guide and does not show an active cylinder-engaging part which is itself slotted to accommodate expansion under heating.

Claim 16 calls for active cylinder-engaging parts on both sides of the piston which are separated from the head portion by air gaps, with one of the said cylinder-engaging parts split longitudinally. Clearly, this subject matter is not disclosed in the references.

Ser. No. 204,661. 12450

Claim 17 is along the line of Claim 14 but brings out in addition the unbroken skirt formation between the active cylinder-engaging parts at the lower or open end of the guide portion of the piston.

Claim 18 is along the line of Claim 17 but specifies in addition the longitudinal split through one of the active cylinder-engaging parts.

Claim 19 is directed more especially to the nature of the connections between the bosses and the head, in conjunction of course with other features of applicant's construction.

Claim 20 is along the line of Claim 16 but is more specific as to the walls joining the head and guide portions and the bosses.

Claim 21 is also along the line of Claim 16 but specifies in addition the yielding or resilient character of the guide structure which permits the closing and opening of the split wall of the skirt.

Claim 22 brings out more specifically the location of the longitudinal split of the guide portion with respect to the walls which connect the guide portion, the bosses and the head.

Claim 23 brings out the relation of the head and guide portion, the bosses and the longitudinally disposed walls which connect them, the structure defined being exceedingly strong with respect to the longitudinal stresses to which the piston structure is subjected.

Claim 24 is along lines somewhat similar to Claim 23 but brings out the curved formation of the connecting webs or walls, one form of such construction being shown in Figs. 5 and 6 of the drawing.

Claim 25 is specifically directed to applicant's means which are provided for oiling the pin boss bearings.

Claims 26 and 27 are identical with Claims 5 and 10, respectively, of the patent to Long, No. 1,395,441.

Claim 28 is identical with Count 1 of the Issue in

Interference No. 43,351, Hartog vs. Pomeroy, which has recently been brought to applicant's attention.

Applicant seems clearly entitled to make Claims 26, 27 and 28 and believes that he is the first inventor of the subjects matter defined in said claims.

In the drawing, the reference numeral "19" is incorrectly applied in Figs. 1 and 5. Permission is re-

quested to have these numerals changed to agree with Fig. 3 and with the specification as shown on the print filed herewith.

Respectfully submitted,

EDWARD J. GULICK,
By MILTON TIBBETTS,
His Attorney.

Detroit, Mich.
September 8, 1922.

—11— 204661—42

(Patent Office Oct 6 1922 Mailed)
2—260

Div. 12 Room 322 Paper No. 12

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, Oct. 6, 1922

Milton Tibbetts,
c/o Packard Motor Car Co.,
Detroit, Mich.

Please find below a communication from the Examiner in charge of the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, Pistons.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Amended Sept. 11, 1922.

Claims 14 and 16 to 22 inclusive are rejected as being unwarranted by applicant's disclosure. The skirt portion shown by the drawings is not divided into "parts," "sections" or "portions." The same consists of a

single unitary structure or cylindrical body split on one side only. It is not thought such a structure can be accurately described as being divided into "segments" or parts. Such a division would be purely arbitrary and along imaginary lines, as it would be extremely difficult to ascertain just where one part ended and the other began, the whole skirt being in one piece.

Claim 25 is rejected on Nichols of record in view of Marcil, 920,165, May 4, 1909 (74-109-4)

Claim 26 is rejected as being unwarranted. It is not thought that the configuration formed by joining the circumferential and vertical or longitudinal slots, shown by applicant, can be accurately described as "T-shape." There appears to be a too remote resemblance, if any, between a "T" and a character of this nature "p", or

204661—43

204,661—2

this "q".

Inasmuch as the subject matter defined by claim 28 does not appear to have been embraced in the statement of invention or claims originally presented, applicant is required to file a supplemental oath, in accordance with Rule 48 of the Rules of Practice, in support of same.

The remaining claims are allowed.

The examiner notes that allowed claim 27 has been copied from the patent to Long, No. 1,395,441, and interference proceedings will be instituted in due course.

P. P. Pierce,
Examiner.

V.I.C.

204661—44

12452

(Mail Room Mar 19 1923 U. S. Patent Office)

IN THE UNITED STATES PATENT OFFICE

Division 12, Paper No. 13
Mar 20 1928
U. S. Patent Office

Application of
Edward J. Gulick,
Pistons,
Serial No. 204,661,
Filed November 30, 1917.

Amdt F
&
Sup. Oath
Div.—12,
Rm.—322.

~~Not~~ ent Ch.

The Commissioner of Patents,
Washington, D. C.

Sir:—

In response to the Office Letter of October 6th, 1922, applicant amends as follows:

On page 4 of the specification, strike out the matter heretofore inserted in line 12 after the period, and insert in lieu thereof the following: —*As these openings are well above the bottom of the guide portion of the piston the lower end of the piston skirt is left unbroken, except for the split 21, and the arcuate parts of the skirt beneath said openings may be looked upon as joining the lower ends of the diametrically opposite cylinder-engaging parts of the guide that sustain the angular thrust of the connecting rod.*—

Insert the words —*on an axis*— at the following points in the claims:

Claim 14, line 7, after "disposed";
Claim 16, line 7, after "disposed";
Claim 17, line 9, after "disposed";
Claim 18, line 10, after "disposed";
Claim 19, line 5, after "disposed";
Claim 20, line 8, before "between";
Claim 21, line 7, after "disposed";
Claim 22, line 6, after "disposed".

In Claim 17, line 5, and in Claim 18, lines 4 and 5, strike out "constituting unbroken continuations of" and insert in lieu thereof —*joining*—.

204661—45

Serial No. 204,661. 12453

In Claim 19, line 4, before "each", insert —*to take the angular thrust of a connecting rod and* —.

Same claim, line 9, change "end portions" to —*head portion*—.

Strike out Claims 25 and 26, and insert the following claims:

—25. A piston for internal combustion engines, comprising a head portion, a guide portion, a pair of separated pin bosses having their outer ends within the maximum diameter of the

piston, and means for lubricating the interior of each of said bosses comprising a passage extending entirely through its wall, a recess in the peripheral wall of the guide portion and a duct leading from said recess to said passage.

---

25. ~~26.~~ An integrally formed piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a pair of separated pin bosses, and a guide portion
per H connected to said bosses and having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part
per H being separated at its upper end from said side wall of the head portion by an air gap and be-
per H ing split longitudinally between its connection to said bosses to accommodate expansion incident to the heating of the piston.

F3 26. ~~27.~~ An integrally formed piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically
per I opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end
per H from the said side wall by an air gap, spaced supporting connections between said head and guide portions, ~~and~~ one of said cylinder-engag-
per H ing parts being split longitudinally between its supporting connections from its upper edge to

its lower edge, and a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts.

27. ~~28.~~ A one-piece piston with a solid
per H end portion and a skirt portion supported therefrom by spaced integral connections and having formed in its peripheral face a transverse slot adjacent the solid end of the piston
per H and a single longitudinal slot in the skirt be-
per H tween the spaced integral connections and extending from the transverse slot to the open end of the piston, said slots forming ad-
per H jacent disconnected main peripheral bear-

per H ing portions in the skirt which are capable
Insert H[a] of unrestrained outward and inward movement.— (4) H[a]

Renumber Claims 27 and 28 as 29 and 30.

The Examiner's criticism of Claims 14 and 16 to 22, inclusive, has been carefully considered and it is respectfully submitted that the criticism is not well founded. The Examiner states that the "skirt portion shown by the drawings is not divided into 'parts,' 'sections,' or 'portions'." Apparently the Examiner has misread the claims since none of them describes the skirt as "divided into" parts, sections or portions. What the claims do describe is "a guide portion having diametrically opposite cylinder-engaging parts to take the angular thrust of a connecting rod." To be sure these "diametrically opposite cylinder-engaging parts" are defined only by imaginary lines insofar as the disclosure of the piston structure is concerned, but the description of these parts as "opposite cylinder-engaging parts" is by no means "arbitrary," as stated by the Examiner. As is understood by every engineer familiar with internal combustion engine practice, a certain amount of working clearance between the piston and its cylinder is absolutely

essential and, as a result of this clearance, the amount of the peripheral piston surface which actually engages the cylinder wall to take the angular thrust of the connecting rod is limited to two sections or parts each very considerably less than 180° in extent and disposed, of course, on opposite sides of the wrist pin. The angular extent of these cylinder-engaging parts is somewhat variable with the amount of the clearance, but with the cylinder and piston parts of given dimensions the angular extent of these opposite cylinder-engaging parts can be definitely determined, and there is nothing "arbitrary" about the matter.

It is respectfully submitted that the terminology of the claims in question is clear and strictly in accord with the facts and a reconsideration and allowance of said claims is urged.

Claim 25 has been rewritten to more clearly characterize the distinguishing features of applicant's lubricating means. It is submitted that the reference patents to Nichols and Marcil fall short of suggesting applicant's

construction. In the patent to Marcil there seems to be no provision whatever for conducting lubricant to the passages 16, and the construction shown in the Nichols patent would not be applicable to a piston of the type of applicant's as defined in Claim 25.

With respect to former Claim 26, which was identical with Claim 5 of the patent to Long, No. 1,395,441, the Examiner's position is understood to be that said claim in the Long patent must be read as limited to a literally T-shaped slot and that a piston in which the horizontal slot extends around the piston does not fall within the bounds of the claim.

Therefore, in order to avoid further delay in the declaration of an interference with the Long patent, applicant has eliminated the "T-shaped" terminology and respectfully urges that an interference involving Claim

29 (Claim 10 of the Long patent) be at once declared.

A supplemental oath is filed herewith in view of the Examiner's requirement in connection with Claim 30 (former Claim 28).

Respectfully submitted,

EDWARD J. GULICK,
By MILTON TIBBETTS,
His Attorney.

(Mail Room U. S. Patent Office Mar 19 1923)

IN THE UNITED STATES PATENT OFFICE

Application of
Edward J. Gulick,
Pistons,
Serial No. 204,661,
Filed November 30, 1917.

SUPPLEMENTAL OATH

COUNTY OF CUYAHOGA } ss.
STATE OF OHIO }

The undersigned, EDWARD J. GULICK, being first duly sworn, deposes and says that he is the Edward J. Gulick who filed the above-entitled application, Serial No. 204,-

661; that he has read the said application as it stands amended after the filing of the amendatory paper filed September 11th, 1922; that the subjects matter of all amendments of the said application, including the amendment filed September 11th, 1922, were part of his invention, were invented before he filed his original application, above identified, for such invention; that he does not know and does not believe that his invention, including the subjects matter of the said amendments, was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention, including the subjects matter of the said amendments, has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; that no application for patent on said invention, including the subjects matter of the said amendments, has been filed by him or his legal representatives or assigns in any country foreign to the

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Gulick Ser. No. 204,661. 12458

United States; and that his said invention, including the subjects matter of the said amendments, has never been abandoned.

EDWARD J. GULICK.

Sworn to, subscribed and acknowledged, before me this 8th day of November, 1922.

HELEN M. SINGER,

(Notarial Seal) *Notary Public.*

(Mailed Patent Office Apr 5 1923)

2-260

Div. 12 Room 322 Paper No. 14

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

Ch-D

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington, April 5, 1923.

Copy sent applicant
and assignee

Milton Tibbetts,
c/o Packard Motor Car Co.,
Detroit, Mich.

Please find below a communication from the EXAMINER in charge of the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, PISTONS.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Amended March 19, 1923.

The following claims are suggested to the applicant for the purpose of interference:

—A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being co-operably connected at their opposite ends to said cylinder engaging portion.

A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

A piston closed at one end and open at its opposite end, said piston having an annular cutting formed through the thickness of its peripheral wall thereby providing a separated sleeve-like skirt which is approximately cylinder bearing in its entirety, a pair of wrist pin bearings depended from said piston end and being free from engagement with said skirt, supporting means extending from each of said bearings to said skirt, said skirt being provided with a longitudinal slot cut through the thickness of its wall and extending from the open end thereof to said annular cutting.

Failure to make the above claims within thirty days

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from the date of mailing of this letter will be taken as a disclaimer of the subject matter covered thereby.

R. M. Weaver,
Acting Examiner, Div. 12.

V.I.C.

204661—53

12459

(Mail Room Apr 18 1923 U. S. Patent Office)
Division 12, Paper No. 15
Apr 17 1923
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

Edward J. Gulick
Pistons
Filed November 30, 1917
Room No. 322
Division No. 12
Serial No. 204,661

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

G This application is amended as follows:

Add the following claims:

30. ~~21G.~~ ~~20.~~ A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its
G' peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion and separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being co-operably connected at their opposite ends to said cylinder engaging portion.

31. ~~22G.~~ ~~20.~~ A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

32. ~~23G.~~ ~~21.~~ A piston closed at one end and open at its opposite end, said piston having an annular cutting

204661—54

12460

formed through the thickness of its peripheral wall thereby providing a separated sleeve-like skirt
G' contd which is approximately cylinder bearing in its entirety, a pair of wrist pin bearings depended from said piston end and being free from engagement with said skirt, supporting means extending from each of said bearings to said skirt, said skirt being provided with a longitudinal slot cut through the
Per H thickness of its wall between its connections to said supporting means and extending from the open end thereof to said annular cutting.—

Add H[10] Cls 33-43

REMARKS

This amendment is in response to the Office Letter of April 5, 1923 and applicant reserves the right to consider the claims again after the structure upon which they have been drawn is disclosed.

Respectfully,

EDWARD J. GULICK,
By MILTON TIBBETTS,
His Attorney.

Detroit, Michigan
April 13, 1923
MT:TS

2—079

INTERFERENCE (1).

Interference No. 49569 Paper No. 16
Name, Edward J. Gulick
Serial No. 204661
Title, Pistons
Filed, Nov. 30/17
Interference with R. E. Day, G. A. Taylor; H. E. Maynard; S. D. Hartog, E. C. Long & Frank Jardine.

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, Favorable	Dated, July 2/28
Board, Affirmed	Dated, June 3-1929
~~Commissioner~~, Court Affirmed	Dated, Feby. 25, 1931

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

(U. S. Patent Office Jul 7 1923 Mailed)

2—217

Forwarded from 12 Div. to Examiner of Interferences. June 15 1923 Ch-D

Paper No. 17 [Interference.] "A" (1)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee

Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, Pistons.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49569

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count

1. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being

split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

This interference involves your application above identified and an application for Pistons, filed by Ray E. Day, of 3825 North 24th Street., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Illinois,

An application for Pistons, filed by George A. Taylor, of 164 Dana Avenue, Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland and Dike, of Tremont Bldg., Boston, Mass.,

An application for Pistons, filed by Frank Jardine,

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of c/o The Aluminum Castings Co., Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures Inc., Cleveland, Ohio,

An application for Pistons, filed by Howard E. Maynard, of 700 Calvert Avenue, Detroit, Michigan, whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Michigan,

An application for Pistons, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Missouri, whose attorney is Rippey and Kingsland of The Rialto Bldg., St. Louis, Missouri, and

An application for Internal Combustion Engine Pistons, filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, whose attorney is Herbert G. Fletcher, of 321 International Life Bldg., c/o Knight Bros., St. Louis, Missouri.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Hartog	Jardine	Long	Maynard	Taylor
1	14	15	30	15	10	12	13

P. P. Pierce,

Examiner, Div. 12.

V.I.C.

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2—079

INTERFERENCE.

"B" (2)

Interference No. 49570 Paper No. 18
Name, Edward J. Gulick
Serial No. 204,661
Title, Pistons
Filed, Nov. 30, 1917
Interference with S. D. Hartog; H. E. Maynard; F. Jardine; E. C. Long; G. A. Taylor and R. E. Day.

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, Favorable	Dated, July 2/28.
Board, Affirmed	Dated, June 3-1929
~~Commissioner,~~ Court Affirmed	Dated, Feby. 25, 1931

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

204661—59

(Mailed U. S. Patent Office Jul 7 1923)

Forwarded from 12 Div. to Examiner of Interferences. Paper No. 19

June 15, 1923 [INTERFERENCE.]
Ch-D "B"
(2)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

~~Copy~~ sent assignee.

Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, PISTONS.

Very respectfully,
THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49570

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

This interference inyolves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 N. 24th Street, Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for PISTONS, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for PISTON FOR AN INTERNAL COMBUSTION MOTOR filed by Elmer C. Long, of 4834 Beaubien St., Detroit, Mich., whose attorney is Herbert G. Fletcher, of 1111 Internation Life Bldg., St. Louis, Missouri,

204661—60

204661—2

An application for PISTONS, filed by Frank Jardine, of c/o The Aluminum Castings Co., Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures Inc., of Cleveland, Ohio,

An application for PISTONS, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Michigan, whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Michigan, and

An application for PISTONS, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Mo., whose attorney is Rippey & Kingsland, of The Rialto Bldg., St. Louis, Missouri.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Hartog	Jardine	Long	Maynard	Taylor
1	15	30	1	16	13	13	14.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

204661—61

2-079

INTERFERENCE.

"C" (3)
Paper No. 20

Interference No. 49571
Name, Edward J. Gulick,
Serial No. 204,661
Title, PISTONS
Filed, Nov. 30, 1917
Interference with R. E. Day; G. A. Taylor; Albert Spillman; F. Jardine; H. E. Maynard; E. C. Long (Kelm added)
Intfs. Nos. 49573, 49577 & 49588 consolidated herewith.

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, Favorable	Dated, July 2/28
Board, Affirmed	Dated, June 3 1929
Commissioner,	Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

204661—62

(Mailed U. S. Patent Office Jul 7 1923)

2-213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923

Paper No. 21
[INTERFERENCE.]
"C" (3)

Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, PISTONS.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322
Address only
The Commissioner of Patents
Washington, D. C.

49571

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings de-

pended from said ring supporting portion and separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being co-operably connected at their opposite ends to said cylinder engaging portion.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.

An application for PISTONS, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for ENGINE PISTONS, filed by Albert Spillman, of 261 Payne Ave., North Tonawanda, New York, whose attorney is Geyer and Popp, of 619 Brisbane Bldg., Buffalo, N. Y.,

204661—63

434,467—2

An application for PISTONS, filed by Frank Jardine, of c/o The Aluminum Castings Company, Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures Inc., of Cleveland, Ohio,

An application for PISTON, filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, whose attorney is Herbert G. Fletcher, of International Life Bldg., St. Louis, Mo., and

An application for PISTONS, filed by Howard E. Maynard, of 700 Calvert Avenue, Detroit, Michigan, and whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Michigan.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Jardine	Long	Maynard	Spillman	Taylor
1	16	31	17	1	14	13	15

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

204661—64

2-079

INTERFERENCE (4).

Interference No. 49572 Paper No. 22
Name, Edward J. Gulick
Serial No. 204,661
Title, Pistons
Filed, Nov. 30, 1917
Interference with E. C. Long; S. D. Hartog; H. E. Maynard; F. Jardine; A. D. Spillman and G. A. Taylor.

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, Consolidated with No. 49569	Dated, 6 et 8/25
Board,	Dated,
Commissioner,	Dated,

REMARKS:

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This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

204661—65

(U. S. Patent Office Jul 7 1923 Mailed)

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 23
[INTERFERENCE.]
"D" (4)

2—213

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee.

Milton Tibbetts,
c/o Packard Motor Car Co.,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, filed Nov. 30, 1917, Serial No. 204,661, PISTONS.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322
Address only
The Commissioner of Patents
Washington, D. C.

49572

The case above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug 27 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

This interference involves your application above identified and an application for Pistons, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for Engine Pistons, filed by Albert Spillman, of 261 Payne Ave., North Tonawanda, N. Y., whose attorney is Geyer & Popp, of 619 Brisbane Bldg., Buffalo, N. Y.

An application for Pistons, filed by Frank Jardine, of c/o the Aluminum Castings Co., Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East

204661—66

204661—2

9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures Inc., of Cleveland, Ohio,

An application for Pistons, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Michigan, whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Mich.,

An application for Pistons for Internal Combustion Motors, filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, whose attorney is Herbert G. Fletcher, of c/o Knight Bros., 321 International Life Bldg., St. Louis, Mo., and

An application for Pistons, filed by Stephen D. Hartog, of 3219 Natural Bridge Avenue, St. Louis, Mo., and whose attorney is Rippey & Kingsland, of The Rialto Bldg., St. Louis, Mo.

The relation of the count of this interference to the claims of the respective parties is as follows:

Count	Gulick	Hartog	Jardine	Long	Maynard	Spillman	Taylor
1	32	24	20	7	15	16	16.

P. P. Pierce,

V. I. C. *Examiner, Div. 12.*

204661—67

2—079

INTERFERENCE.

"E" (5)
Paper No. 24

Interference No. 49573
Name, Edward J. Gulick,
Serial No. 204,661
Title, Pistons
Filed, Nov. 30, 1917
Interference with Howard E. Maynard; Elmer C. Long; Stephen D. Hartog; Frank Jardine and Ray E. Day.

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences,	Dated,
Board,	Dated,
Commissioner,	Dated,

REMARKS:

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.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

204661—63

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 25
[INTERFERENCE.]
"E" (5)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee.

Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, Pistons.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49573

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug 27 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.

This interference involves your application above identified and an application for Pistons, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for Pistons, filed by Frank Jardine, of c/o The Aluminum Castings Company, Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures, Inc., of Cleveland, Ohio,

An application for Pistons, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Michigan, whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Mich.,

204661—69

204,661—2

An application for Pistons, filed by Stephen D. Hartog, of 3219 Natural Bridge Avenue, St. Louis, Mo., whose attorney is Rippey and Kingsland, of The Rialto Bldg., St. Louis, Mo., and

An application for Internal Combustion Engine Pistons, filed by Elmer C. Long, of 1037 Main St., Quincy, Ill., whose attorney is Herbert G. Fletcher, of 321 International Life Bldg., St. Louis, Missouri.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Hartog	Gulick	Jardine	Long	Maynard
1	10	28	1	12	8	8

P. P. PIERCE,
Examiner, Div. 12.

V. I. C.

204661—70

2—079

INTERFERENCE.

"F" (6)
Paper No. 26

Interference No. 49574
Name, Edward J. Gulick
Serial No. 204,661
Title, Pistons
Filed, Nov. 30, 1917
Interference with S. D. Hartog; H. E. Maynard; E. C. Long; G. A. Taylor, R. E. Day

DECISIONS OF

~~Primary~~ Law Examiner, Interference dissolved — Dated, Apr. 4 1924
Ex'r of Interferences, — Dated,
Board, — Dated,
Commissioner, — Dated,

REMARKS:

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.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

204661—71

(U. S. Patent Office Jul 7 1923 Mailed)

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 27
[Interference.]
"F" (6)

2—213

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee.

Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, Pistons.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49574

The case, above referred to, is adjudged to interfere with others, hereafter specified; and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug 27 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston closed at one end and open at its opposite end, said piston having an annular cutting formed through the thickness of its peripheral wall thereby providing a separated sleeve-like skirt which is approximately cylinder bearing in its entirety, a pair of wrist pin bearings depended from said piston end and being free from engagement with said skirt, supporting means extending from each of said bearings to said skirt, said

skirt being provided with a longitudinal slot cut through the thickness of its wall and extending from the open end thereof to said annular cutting.

This interference involves your application above identified and an application for Pistons, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for Pistons, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for Pistons, filed by Elmer C. Long of 4834 Beaubien St., Detroit, Mich., whose attorney is Herbert G. Fletcher, of International Life Bldg., St. Louis, Missouri.

204661—72

204,661—2

An application for Pistons, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Mich., whose attorney is Whittemore, Hulbert, and Whittemore, of Penobscot Bldg., Detroit, Michigan, and

An application for Pistons, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Mo., and whose attorney is Rippey & Kingsland, of The Rialto Bldg., St. Louis, Missouri.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Hartog	Long	Maynard	Taylor
1	18	33	32	1	16	18.

P. P. Pierce,
Examiner, Div. 12.

V.I.C.

204661—73

2—079

INTERFERENCE.

"G" (7)

Interference No. 49575 Paper No. 28
Name, Edward J. Gulick,
Serial No. 204,661
Title, Pistons
Filed, Nov. 30, 1917
Interference with H. E. Maynard; E. C. Long; G. A. Taylor; R. E. Day.

Decisions of	
Primary Examiner,	Dated,
Ex'r of Interferences, Favorable	Dated, Apr 8/24
Board, "	Dated, Aug 7/24
Commissioner, Affirmed	Dated, Apr 7 1925
Court Affirmed	" Feby. 7, 1927.

Remarks:

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This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

204661—74

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.

Paper No. 29
[Interference.]
"G" (7)

June 15, 1923

Ch-D

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C.

Copy sent assignee.

Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Mich.

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, Pistons.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322
Address only
The Commissioner of Patents
Washington, D. C.

49575

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head por-

tion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

This interference involves your applications above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., and whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for PISTONS, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., and whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for PISTON FOR AN INTERNAL COMBUSTION ENGINE, filed by Elmer C. Long, of 4834 Beaubien St., Detroit, Mich., and whose attorney is Herbert G. Fletcher, of 1111 International Life Bldg., St. Louis, Mo., and

204661—75

204,661—2

An application for PISTONS, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Mich., and whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Mich.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Long	Maynard	Taylor
1	13	13	12	11	12.

P. P. PIERCE,

V.I.C. *Examiner, Div. 12.*

204661—76

INTERFERENCE.

"H" (8)

Interference No. 49576 Paper No. 30
Name, Edward J. Gulick,
Serial No. 204,661
Title, Pistons
Filed, Nov. 30, 1917
Interference with H. E. Maynard; E. C. Long; F. Jardine; R. E. Day

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, Favorable	Dated, Apr. 10/24.
Board,	Dated,
Commissioner,	Dated,

REMARKS:

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This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

204661—77

(U. S. Patent Office Jul 7 1923 Mailed)

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 31
[Interference.]
"H" (8)

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C.

Copy sent assignee.

Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Mich.

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, Pistons.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 332
Address only
The Commissioner of Patents
Washington, D. C.

49576

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction and the skirt portion being cut away adjacent the outer ends of the piston bosses.

This interference involves your application above identified and an application for Pistons, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., and whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for Pistons, filed by Frank Jardine, of c/o The Aluminum Castings Company, Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures, Inc., Cleveland, Ohio,

204661—78

204,661—2

An application for Pistons, filed by Elmer C. Long, of 4834 Beaubien St., Detroit, Mich., and whose attorney is Herbert G. Fletcher, of International Life Bldg., St. Louis, Missouri, and

An application for Pistons, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Michigan, whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Michigan.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Jardine	Long	Maynard
1	12	12	14	11	10.

P. P. Pierce,

Examiner, Div. 12.

V. I. C.

204661—79

2-079

INTERFERENCE.

"I" (9)

Paper No. 32

Interference No. 49577
Name, Edward J. Gulick
Serial No. 204,661
Title, PISTONS
Filed, Nov. 30, 1917
Interference with E. C. Long; H. E. Maynard; F. Jardine and R. E. Day.

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences,	Dated,
Board,	Dated,
Commissioner,	Dated,

REMARKS:

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This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

204661—80

2-213

Forwarded from 12 Div. to Examiner of Interferences. June 15, 1923

Paper No. 33
[INTERFERENCE.]
"I" (9)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee
Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Michigan.

(Mailed U. S. Patent Office Jul 7 1923)

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, PISTONS.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322
Address only
The Commissioner of Patents
Washington, D. C.

49577

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion

except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for PISTONS, filed by Frank Jardine, of c/o The Aluminum Castings Company, Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures, Inc., of Cleveland, Ohio,

An application for PISTONS, filed by Howard E. May-

204661—81

204,661—2

nard, of 700 Calvert Ave., Detroit, Mich., and whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Mich., and

An application for INTERNAL COMBUSTION ENGINE PISTONS, filed by Elmer C. Long, of 1037 Main St., Quincy, Ill., and whose attorney is Herbert G. Fletcher, of 321 International Life Bldg., c/o Knight Bros., St. Louis, Mo.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Jardine	Long	Maynard
1	11	11	13	9	9.

P. P. PIERCE,
Examiner, Div. 12.

V. I. C.

204661—82

2—079

INTERFERENCE.

"L" 12

Interference No. 49580 Paper No. 34
Name, Edward J. Gulick
Serial No. 204,661
Title, Pistons
Filed, Nov. 30, 1917
Interference with S. D. Hartog; E. C. Long; G. A. Taylor

DECISIONS OF

~~Primary~~ Law Examiner, Interference dissolved Dated, Apr 4 1924
Ex'r of Interferences, Dated,
Board, Dated,
Commissioner, Dated,

REMARKS:

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This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

204661—83

2—213

(U. S. Patent Office Jul 7 1923 Mailed)

Forwarded from 12 Div. to Examiner of Interferences. June 15, 1923 Paper No. 35 [Interference.] "L"

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Michigan

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, Pistons.

Very respectfully,

THOMAS E. ROBERTSON.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49580

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses integrally connected to the head and to the upper and lower part of the skirt, the outer ends of the pin bosses being spaced from the opposing parts of the skirt wall and said skirt having openings opposite the open ends of the bosses.

This interference involves your application above identified and an application for Pistons, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., and whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for Piston for an Internal Combustion Motor, filed by Elmer C. Long, of 4834 Beaubien St., Detroit, Mich., whose attorney is Herbert G. Fletcher, of 1111 International Life Bldg., St. Louis, Mo., and

An application for Pistons, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Mo., and whose attorney is Rippey and Kingsland, of The Rialto Bldg., St. Louis, Mo.

204661—84

204,661—2

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Gulick	Hartog	Long	Taylor
1	2	29	11	11

P. P. Pierce,
Examiner, Div. 12.

V.I.C.

204661—85

2—079

INTERFERENCE.

"S" 19

Interference No. 49587 Paper No. 36
Name, Edward J. Gulick
Serial No. 204,661
Title, Pistons
Filed, Nov. 30, 1917
Interference with Stephen D. Hartog

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	Favorable	Dated, Apr. 8/24
Board,		Dated,
Commissioner,		Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters.

204,661—86

(U. S. Patent Office Jul 7 1923 Mailed)

Forwarded from 12 Div to Examiner of Interferences.
June 15,1923
Ch-D

Paper No. 37
[INTERFERENCE.]
"S"

Copy sent Assignee.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE
WASHINGTON, D. C.

Milton Tibbetts,
c/o Packard Motor Car Co.,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, PISTONS.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Address only
The Commissioner of Patents
Washington, D. C.

49587

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. In a piston, the combination of a head portion having an end wall and a side wall, a guide portion, a pair of separated piston pin bosses connected to the head portion, and webs disposed longitudinally of the piston integrally joining the inner parts of said bosses to the guide portion in the zone of said bosses.

This interference involves your application above identified and an application for Pistons, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Missouri, and whose attorney is Rippey and Kingsland, of The Rialto Bldg., St. Louis, Mo.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Gulick	Hartog
1	23	31.

P. P. Pierce,
Examiner, Div. 12.

V.I.C.

204661—87

2-079

INTERFERENCE.

"T" 20

Interference No. 49588 Paper No. 38
Name, Edward J. Gulick
Serial No. 204,661
Title, PISTONS
Filed, Nov. 30, 1917

Interference with Elmer C. Long, Pat. No. 1,395,441, dated Nov. 1, 1921.

DECISIONS OF

Primary Examiner, ... Dated, ...
Ex'r of Interferences, ... Dated, ...
Board, ... Dated, ...
Commissioner, ... Dated, ...

REMARKS:

.....
.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

204661—88

(U. S. Patent Office Jul 7 1923 Mailed)

Forwarded from 12 Div. to Examiner of Interferences, June 15, 1923 Ch-D

Paper No. 39
[Interference.]
"T"

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C.

Copy sent assignee.

Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661, PISTONS

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49588

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug 27 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A one piece piston provided with a solid end portion and a skirt portion, said skirt portion having a longitudinally extending slot formed through the thickness of its wall, said slot extending from the rear edge of the skirt portion and forming adjacent disconnected portions in said skirt portion which are capable of being moved inwardly or outwardly without restraint.

This interference involves your application above identified and patent No. 1,395,441, Dated Nov. 1, 1921, application filed Dec. 9, 1918, Serial No. 265,947, by Elmer C. Long, of 1037 Main St., Quincy, Illinois, and whose attorney is Herbert G. Fletcher, of 321 International Life Bldg., St. Louis, Missouri.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Gulick	Long
1	29	10.

P. P. Pierce,
Examiner, Div. 12.

V.I.C.

204661—89

204,661—40

(Docket Division Jun 29 1923 U. S. Patent Office)

IN THE UNITED STATES PATENT OFFICE

Edward J. Gulick
Pistons
Filed November 30, 1917

Room No. 322
Division No. 12
Serial No. 204,661

POWER OF ATTORNEY

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

Please recognize Messrs. Watson, Coit, Morse & Grindle, consisting of James A. Watson, John M. Coit, Robert W. Morse, and Chas. S. Grindle, and R. C. Watson, (Registration No. *11,307*) of Washington, D. C., as associate attorneys in this application, but with the understanding that the Patent Office will carry on its correspondence with me as in the past.

MILTON TIBBETTS,
Attorney for Gulick.

(U. S. I. R. Documentary Stamp, 25 Cents.)

Detroit, Michigan
June 18, 1923
MT:TS

49569
to
49592
204661—90

(U. S. Patent Office Dec 3 1923 Mailed)

Div. 12 Room 322

Paper No. 41

Address only
"The Commissioner of Patents,
Washington, D. C."
and not any official by name.

Ch-D

All communications respecting this application should give the serial number date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
WASHINGTON

Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Michigan.

Please find below a communication from the Examiner in charge of the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661 PISTONS

THOMAS E. ROBERTSON,
Commissioner of Patents.

49571

In accordance with the provisions of Rule 129, the application for patent filed by Gustav R. Kelm, whose post-office address is c/o Walker M. Levett Company, 417 East 23rd St., New York, New York, whose attorney is Clarence D. Kerr, of No. 5 Nassau Street, New York, New York, and whose assignee is the Walker M. Levett Company, New York, New York, a corporation of New York, is hereby added to Interference No. 49571, between Day v. Taylor v. Spillman v. Maynard v. Jardine v. Long v. Gulick, to which you are a party. The claim of Kelm's application corresponding to the count of the issue is

Count	Claim
1	7.

The new party only is given until the 31 day of Dec, 1923, within which to file the preliminary statement required by Rule 110.

The issue of the interference remains unchanged.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C. 204661—91

(U. S. Patent Office Dec 3 1923 Mailed)

Div. 12 Room 322 Paper No. 42

Address only
"The Commissioner of Patents,
Washington, D. C."
and not any official by name.

All communications respecting this application should give the serial number date of filing, title of invention, and name of the applicant.

Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
WASHINGTON

Milton Tibbetts,
c/o Packard Motor Car Company,
Detroit, Michigan.

Please find below a communication from the Examiner in charge of the application of Edward J. Gulick, Filed Nov. 30, 1917, Serial No. 204,661 PISTONS

THOMAS E. ROBERTSON,
Commissioner of Patents.

49572

In accordance with the provisions of Rule 129, the application for patent filed by Gustav R. Kelm, whose post-office address is c/o Walker M. Levett Company, 417 East 23rd St., New York, New York, whose attorney is Clarence D. Kerr, of #5 Nassau Street, New York, New York, and whose assignee is the Walker M. Levett Company, of New York, New York, a corporation of New York, is hereby added to Interference No. 49572, between Taylor v. Spillman v. Maynard v. Jardine, v. Hartog v. Long v. Gulick, to which you are a party. The claim of Kelm's application corresponding to the count of the issue is:

Count	Claim
1	8.

The new party only is given until the 31 day of Dec, 1923, within which to file the preliminary statement required by Rule 110.

The issue of the interference remains unchanged.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

204661—92

204,661—43

(Mail Room Mar 3 1924 U. S. Patent Office)
(Docket Division Mar 4-1924 U. S. Patent Office)

IN THE UNITED STATES PATENT OFFICE.

In re Application of
EDWARD J. GULICK,
Pistons,
Serial No. 204,661,
Filed November 30th, 1917.

POWER OF ATTORNEY.

The undersigned, The Cleveland Trust Company, a corporation of the State of Ohio, having its place of business in the City of Cleveland, in said State, being (by virtue of an assignment recorded September 18th, 1922, in Liber—S-116, Page-485, of The Transfers of Patents), the Assignee of the entire right, title and interest in and to the above-entitled application and the invention to which it relates, hereby appoints Ray Stewart Gehr, of 1900 Euclid Building, Cleveland, Ohio, its attorney herein, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith; and it hereby revokes all Powers of Attorney heretofore given herein.

IN WITNESS WHEREOF, the said The Cleveland Trust Company, has caused its corporate seal to be hereto affixed, and these presents to be signed and executed in its name and behalf by its duly authorized officers, this 29th day of February, 1924.

THE CLEVELAND TRUST COMPANY.
By C. W. STANSBURY,
Vice President.

(Corporate Seal)

Accepted

Approved and executed by The C. T. Co.
DEM
Asst. Counsel.

Attest:
A. J. PERFLER,
Ass't Trust Officer.

Mar 10 1924

T. E. ROBERTSON,
Commissioner.

(U. S. I. R. Documentary Stamp, 25 Cents.)

204661—93

(Docket Division Mar 4-1924 U. S. Patent Office)
(Mail Room Mar 3 1924 U. S. Patent Office)

Intf June 15/23

Patents and
Patent Causes

Telephone:
Prospect 2273

RAY STEWART GEHR
COUNSELLOR AT LAW
1900 Euclid Avenue
CLEVELAND

February 29th, 1924.

The Commissioner of Patents,
Washington, D. C.

Sir:—

I am enclosing herewith for filing power of attorney in the application of Edward J. Gulick, Serial No. 204,661. This application is now involved in interference proceedings.

Respectfully yours,

RAY S. GEHR.

Enc.
RSG/S

204661—94

EEG

#44
33

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington

March 11, 1924

YOUR POWER OF ATTORNEY HAS BEEN ACCEPTED in the matter of the application of Edward J. Gulick for Letters Patent for an IMPROVEMENT IN Pistons No. 204,661 Filed Nov. 30, 1917.

Respectfully,

THOMAS E. ROBERTSON,
Commissioner.

Ray S. Gehr,
1900 Euclid Bldg.,
Cleveland, Ohio.

204661—95

EEG

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

Washington

March 11, 1924

YOUR POWER OF ATTORNEY HAS BEEN REVOKED by assignee in the matter of the application of Edward J. Gulick for Letters Patent for an IMPROVEMENT IN Pistons No. 204,661 Filed Nov. 30, 1917.

Respectfully,

THOMAS E. ROBERTSON,

Commissioner.

Watson, Coit, Morse & Grindle (Assoc.)
Washington, D. C.

Milton Tibbetts,
c/o Packard Motor Car Co.,
Detroit, Mich.

204661—96

(Application Div. Dec 11 1926 U. S. Patent Office)
(Docket Division Dec 11 1926 U. S. Patent Office)

204,661—45

IN THE UNITED STATES PATENT OFFICE

In the matter of
Application
Serial No. 204,661
Edward J. Gulick
Filed November 30, 1917
For Piston

POWER TO INSPECT AND MAKE COPIES

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

Please permit Wm. L. Symons, Esq., of Washington, D. C. to inspect the above entitled application and to have a copy or copies made thereof, or any part thereof.

Respectfully,

RAY S. GEHR,

Attorney for Gulick.

Cleveland, Ohio,
December 9, 1926

204661—97

(Mail Division Jul 20 1928 U. S. Patent Office)
(Docket Division Jul 20, 1928 U. S. Patent Office)

IN THE UNITED STATES PATENT OFFICE

U. S. Patent Office
Jul 23 1928
Division 12, Paper No. 46
Doc
Div.-12.

In the matter of
the application of
Edward J. Gulick,
For Pistons,
Filed November 30, 1917,
Serial No. 204,661.

WITHDRAWAL.

The Commissioner of Patents,
Washington, D. C.

Sir:

Having on or about February 29, 1924, been appointed the attorney in the above entitled application of the Cleveland Trust Company, assignee of the entire interest of the applicant, I now hereby withdraw from the case as attorney of the said assignee.

Respectfully yours,

RAY S. GEHR.

Cleveland, Ohio,
July 18, 1928.
D
L H G
T B
49,569
49,570
Bd. July 26/28

204661—98

(Mail Division Aug-3 1928 U. S. Patent Office)
(Docket Division Aug 3 1928 U. S. Patent Office)

EVANS & McCOY
PATENT LAWYERS
Bulkley Building
CLEVELAND

Lloyd L. Evans
William C. McCoy
Arnold C. Rood
Frank S. Greene

Telephone
Main 0470

July 31, 1928.

Doc

Commissioner of Patents,
Washington, D. C.

Sir:

Please file the enclosed Power of Attorney in the Application of
Edward J. Gulick
Serial No. 204,666

now involved in the following interferences:

Hartog v. Long v. Gulick	No. 49,569
Long v. Hartog v. Gulick	No. 49,570
Long v. Gulick	No. 49,571

Yours respectfully,

EVANS & McCOY.

WCM:LR
Encl.

204661—99

(Mail Division Aug-3 1928 U. S. Patent Office)
(Docket Division Aug 3 1928 U. S. Patent Office)

#47

IN THE UNITED STATES PATENT OFFICE

In re Application of
EDWARD J. GULICK,
Pistons,
Serial No. 204,661,
Filed November 30th, 1917.

POWER OF ATTORNEY

The undersigned, The Cleveland Trust Company, a corporation of the State of Ohio, having its place of business in the City of Cleveland, in said State, being (by virtue of an assignment recorded September 18th, 1922, in Liber S-116, Page—485, of The Transfers of Patents), The Assignee of the entire right, title and interest in and to the above-entitled application and the invention to which it relates, hereby appoints EVANS & MCCOY, of 724 Bulkley Building, Cleveland, Ohio, its attorneys herein, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith;

IN WITNESS WHEREOF, the said The Cleveland Trust Company, has caused its corporate seal to be hereto affixed, and these presents to be signed and executed in its name and behalf by its duly authorized officers, this 19th day of July, 1928.

THE CLEVELAND TRUST COMPANY.
By H. H. ALLYN,
Vice President.

(Corporate Seal)

Attest:

A. J. PERFLER,
Assistant Trust Officer.

Approved for Execution by The C. T. Co.
R. T. S., *Counsel.*

204661—100

Gulick Patent No. 1,815,733 1925

204661—48

(Docket Division Sep 12 1929 U. S. Patent Office)

IN THE UNITED STATES PATENT OFFICE

Application of
Edward J. Gulick,
Serial No. 204,661,
Filed November 30, 1927,
For PISTONS

Hon. Commissioner of Patents,
Washington, D. C.

POWER TO INSPECT

Sir:

Please permit William L. Symons, of 700 Tenth Street, Washington, D. C., or his duly accredited agent, to inspect and make copies of the papers in the above entitled application.

Respectfully submitted,

EVANS & McCOY,
Attorneys.

Cleveland, Ohio
September 10th, 1929

204661—101

(Mail Room Apr-4 1931 U. S. Patent Office)
(U. S. Patent Office Apr 7 1931 Division 12, Paper No. 49)

IN THE UNITED STATES PATENT OFFICE

6

Application of
Edward J. Gulick,
Serial No. 204,661 Account
Filed Nov. 30, 1917,
For—Pistons
Division 12.

Hon. Commissioner of Patents,
Washington, D. C.

LETTER TO OFFICIAL DRAFTSMAN

Sir:

In the matter of the above entitled application and subject to the approval of the Examiner, kindly correct

Figures 2 and 3 of the drawing, as indicated in red ink on the attached photostat of the drawing.

Please charge the cost of this work to the account of Evans & McCoy.

Respectfully submitted,

EDWARD J. GULICK
By EVANS & McCOY.

a
Int 49569
74 (4)
108
Cleveland, Ohio
April 3, 1931
DBW/LR

Div. C.

(Received in Div. C Apr 11 1931)
(Correction Ordered Apr 11 1931 ... Account)
(Corrected Apr 11 1931)

WEB

Approved Apr 6 1931

C. C. HENRY,
Examiner, Div. 12.

O.K. KWFB
4-9-31.

204661—102

1927

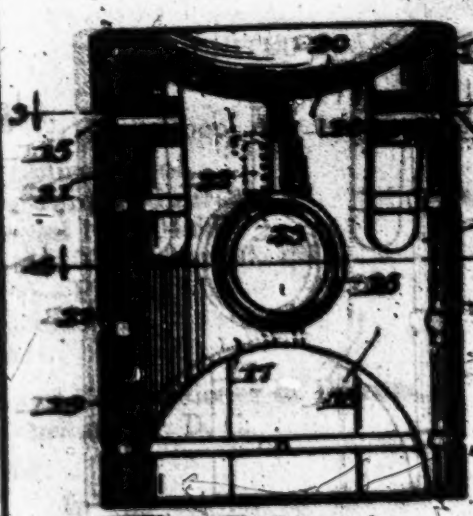

Fig. 2.

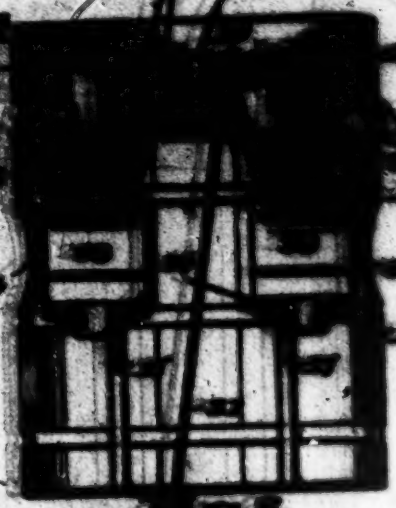

Fig. 3.

Fig. 4.

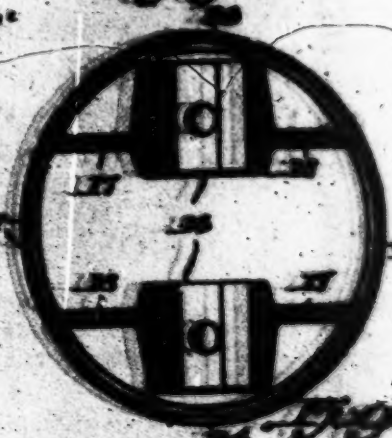

Fig. 5.

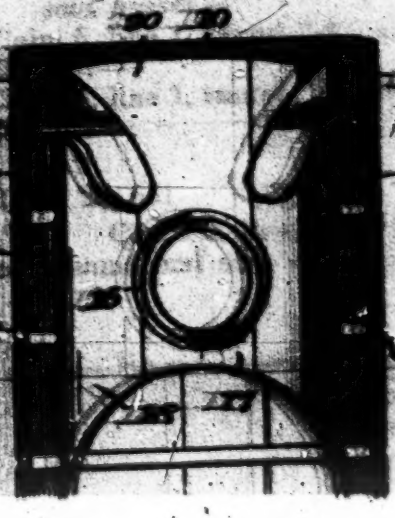

Fig. 6.

Fig. 7.

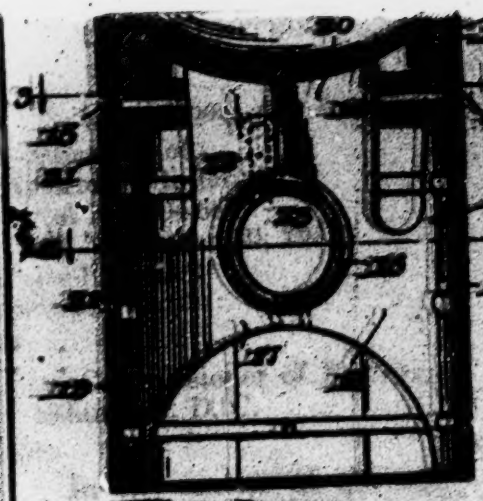

Fig. 1.

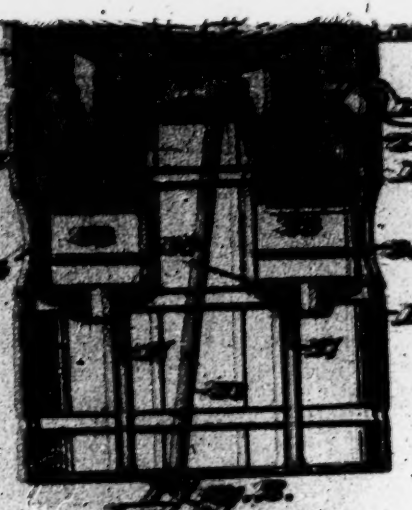

Fig. 2.

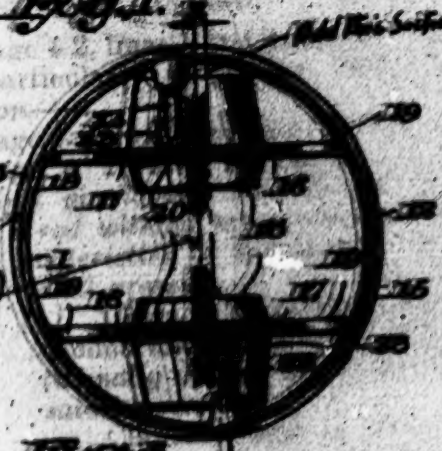

Fig. 3.

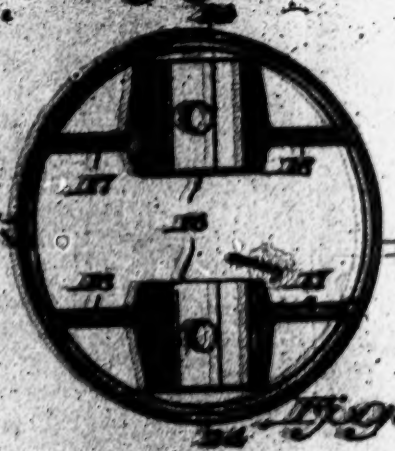

Fig. 4.

Fig. 6.

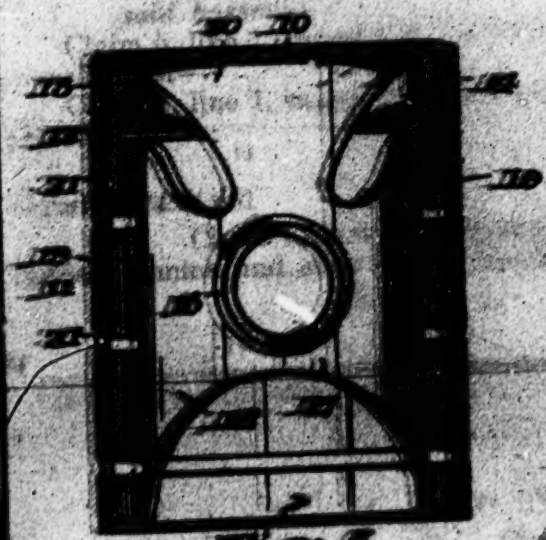

Fig. 5.

Inventor

By Edmund J. Mellick

Wm. T. Abbott

Atty

Reg. Apr. 2 1918

2046661 103

U. S. Patent Office
Apr 7 1931
Division 12, Paper No. 50

IN THE UNITED STATES PATENT OFFICE

12461

(Mail Room Apr 4 1931 U. S. Patent Office)

Application of
Edward J. Gulick,
Serial No. 204,661
Filed November 30, 1917,
For—Pistons
Division 12.
H.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In the matter of the above entitled application, kindly amend as follows:

Page 1 2, lines 1 and 2, cancel "hydrocarbon motors and particularly to pistons therefor" and substitute —*pistons*—;

Page 1 2, line 5, correct the spelling of "seize";

Page 1 2, line 15, cancel the period and add: —*against mechanical load thrust from the connecting rod without interfering with the yielding characteristics of the skirt in response to cylinder wall pressure.*—

H¹

OK

Claim 2, at the end, change the period to a comma and add: —*said skirt being split longitudinally on one side between its connections to said bosses.*—

H²

Claims 4 and 5, at the end, change the period to a comma and add: —*said skirt being split longitudinally between its connections to said bosses.*—

H³

Claim 5, line 1, cancel "A" and substitute —*An integrally cast*—;

Claim 6, line 1, cancel "A" and substitute —*An integrally cast*—;

204661—104

Serial No. 204,661 12462

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Claim 6, last line, change the period to a comma and add: —*said flanges being yieldable*

H⁴ *in the direction of the piston pin boss axis and relatively rigid in the direction of their length.*—

Claim 7, line 2, after "bosses" insert —*integral with the head and disposed*—. Same line, cancel "means" and substitute —*transversely flexible webs*—;

H⁵ Claim 14, line 3, after "having" insert —*an annular bearing surface at the open end thereof and*—;

Claim 14, last line, before "connections" insert —*integral, rigid*—;

H⁶ Claim 16, last line, change the period to a comma and add: —*said split in the cylinder-engaging face of said guide portion being disposed between the connections thereto of said walls.*—

Claim 17, line 9, cancel "walls" and substitute —*transversely flexible walls integrally*—;

Claim 17, line 10, before "joined" insert —*integrally*—;

Claim 17, last line, remove the period and add: —*and integral therewith.*—

Claim 19, line 8, before "connections" insert —*rigid, integral*—;

Copied H⁷ Claim 20, line 5, after "gap" cancel "and" and insert —, *spaced supporting connections between said head and guide portions,*—;

Claim 20, line 7, after "edge" and before the comma insert —*between said supporting connections*—;

Claim 20, line 9, before "connected" insert —*integrally*—;

Claim 21, last line, before the period insert —*during operation*—;

Cancel claim 25.

Claim 26, line 4, after "portion" insert —*connected to said bosses and*—;

Claim 26, line 7, after "wall" insert —*of the head portion*—;

Claim 26, line 8, after "longitudinally" insert —*between its connections to said bosses*—;

Claim 27, line 6, cancel "and" and substitute —, *spaced supporting connections between said head and guide portions*—;

Claim 27, line 7, after "longitudinally" insert —*between its supporting connections*—;

Claim 28, line 2, after "skirt portion" insert —*supported therefrom by spaced integral connections*—;

Claim 28, at the end of line 3, add —*single*—;

Claim 28, line 4, after "longitudinal slot" insert —*in the skirt between the spaced integral connections and*—;

Claim 28, at the end of line 5, insert —*main*—;

Claim 28, line 6, after "peripheral" insert —*bearing*—;

Claim 28, line 6, after "portions" insert —*in the skirt*—;

Claim 28, at the end of the claim, cancel the period and add: —, *the bearing face of said piston diametrically opposite said longitudinal slot being circumferentially continuous between the spaced integral connections of the skirt to the head on that side of the skirt.*— (X) (E⁶ contd fols)

H⁸

Claim 29, line 2, after "skirt portion having" insert —*oppositely disposed thrust bearing faces and*—;

Claim 29, line 4, after "skirt portion" insert —*through one of said thrust bearing faces*—;

Claim 29, line 5, after "disconnected" cancel "portions" and insert —*parts of a thrust bearing face*—;

Claim 33, line 9, after "wall" insert —*between its connections to said supporting means*—;

Serial No. 204,661 12464

Cancel claim 18 and substitute therefor the following claim:

~~24.~~ 18 A piston for an internal combustion engine cylinder comprising in combination, a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts ~~for receiving~~ thereof designed to receive the side thrust of a connecting rod and arcuate cylinder-engaging parts joining said diametrically opposite parts at the lower end of the guide portion to provide an annular bearing face adjacent the open end of the piston, each of said diametrically opposite cylinder-engaging parts being separated at its upper end from the side wall of the head portion, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of spaced walls, each of which connects one of said bosses to said cylinder-engaging parts at points above and below the plane of the boss axis, one of said diametrically opposite

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H⁹

cylinder-engaging parts being split longitudinally from its upper edge to its lower edge between its connections to said walls, and connections extending from the bosses to the head portion, whereby said piston skirt is rendered yieldable during operation in response to cylinder wall pressure.— (X) F[e] Contd fol

—4— 204661—107

Serial No. 204,661 12465

Add the following new claims:

35. 33 A piston for use in an engine cylinder comprising a head, a skirt, ~~having parts~~ of said skirt forming oppositely positioned main bearing portions designed to take the side thrust of a connecting rod, a pair of spaced wrist pin bosses, means integrally connecting the bosses to the head, and means integrally connecting each boss to both of said opposite main bearing portions, one main bearing portion being circumferentially continuous between its connections to the bosses and the other main bearing portion being separated from the head and slit longitudinally between its connections to the bosses to render said slit main bearing portion yieldable in response to pressure from the engine cylinder during operation.

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36. 34 A piston for use in an engine cylinder comprising a head, a skirt, ~~having parts of~~ said skirt forming oppositely positioned main bearing portions to take the side thrust of a connecting rod, a pair of spaced wrist pin bosses, means integrally connecting the bosses to the head, and means integrally connecting each boss to both of said opposite main bearing portions, one main bearing portion being circumferentially continuous between its connections to the bosses and the other main bearing portion being separated from the head and slit longitudinally its entire length between its connections to the bosses to render said slit main bearing portion yieldable in response to pressure from the engine cylinder during operation.

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—5— 204661—108

Serial No. 204,661 12466

~~37.~~ 35 A single-piece, integral piston, comprising a head, a pair of spaced wrist pin bosses having a common axis, a skirt, and means yieldingly connecting the skirt to the head, said skirt being integral

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and having main cylinder bearing faces disposed on opposite sides of the axis of said wrist pin bosses, said skirt being separated from the head at the upper end of each of said bearing faces, one only of said main cylinder bearing faces being slit longitudinally between its connections to the head, whereby said head may expand and contract during operation of said piston substantially independently of said skirt portion when expansion of the skirt portion is restrained.

H10 contd

38. 36 A single-piece, integrally cast piston for use in an engine, comprising a head, wrist pin bosses having a common axis, a skirt, and means connecting said head and bosses and skirt together, said skirt being integral and having a main bearing portion disposed on each side of the said wrist pin boss axis and arranged designed to take the side thrust produced by the angularity of the connecting rod of the engine, said piston having a transverse slit through its wall on one side of the boss axis, portions of said skirt on the transversely slit side of the piston also being slit longitudinally between its connections to said bosses to provide a peripheral main bearing portion in the said transversely slit side of said piston that is capable of yielding in response to pressure from the engine cylinder during operation of the piston.

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(X)

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Serial No. 204,661 12467

39. 37 A single-piece, integral piston for operation in an internal combustion engine cylinder, comprising a head, spaced wrist pin bosses, a longitudinally slitted one piece skirt that is yieldable in response to cylinder wall pressure having cylinder-engaging faces disposed at opposite sides of the axis of said bosses and arranged designed to yieldingly engage the walls of the cylinder during operation, said head and skirt being separated at the upper end of each of said cylinder-engaging faces, and means yieldingly connecting the skirt to said head including means connecting the bosses and the skirt, said means connecting said bosses and said skirt being substantially rigid in the direction transverse to the axis of the bosses, whereby said head portion may expand and contract during oper-

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H10 contd

ation of said piston without binding engagement of the skirt with the walls of the cylinder.

40. 38 A single-piece, integrally cast piston for use in an engine, comprising a head, wrist pin bosses having a common axis, a skirt, and means connecting said head and bosses and skirt together, said skirt being integral and having a main bearing portion disposed on each side of the said wrist pin boss axis and ~~arranged~~ designed to take the side thrust produced by the angularity of the connecting rod of the engine, said piston having a transverse slit through its wall on both sides of the boss axis, one only of said main bearing portions being slit longitudinally between its connections to said bosses to provide a peripheral bearing portion therein that is capable of yielding outward and inward movement relative to the head during operation of the piston.

Per I

" I

—7—

Serial No. 204,661

204661—110

12468

41. 39 A piston for an engine cylinder comprising a skirt, a head separated from the skirt wall around its entire periphery, said skirt being longitudinally slit to render the skirt wall yieldable on every diameter in response to cylinder wall pressure, wrist pin bosses, and means rigidly connecting said bosses to the head and yieldingly connecting said bosses to the skirt whereby said skirt is yieldable in response to cylinder wall pressure.

H[10] contd

42. 40 A piston for an engine cylinder comprising a cylindrical skirt that is longitudinally slit and yieldable on every diameter in response to cylinder wall pressure, a pair of wrist pin bosses having a common axis, said skirt being integral and having a main cylinder bearing portion on each side of the axis of said wrist pin bosses, a head peripherally separated from at least one of said main cylinder-bearing portions, and means connecting the bosses with the skirt, said means being yieldable in the direction of the boss axis and substantially rigid in the direction transverse to said axis, whereby said head may freely expand and contract during operation of the piston when expansion of the skirt is restrained.

Per I

43. 41 A piston comprising a head, a pair of spaced wrist pin bosses rigidly carried by the head and having a common axis, a skirt that is separated from the head

on each side of the wrist pin bosses and longitudinally slit between the bosses on one side only of the bosses to render the skirt circumferentially yielding on that side of said bosses and circumferentially non-yielding on the opposite side of said bosses, and means substantially non-yielding in the direction transverse to the boss axis connecting the bosses with the skirt.

over

—8— 204661—111

Serial No. 204,661 12469

Per I 44. 42 A piston for an engine cylinder comprising, a head, and an integral guide portion having diametrically opposite cylin-
Per I der-engaging parts ~~for receiving thereof~~ designed to receive the thrust of a connecting rod during operation, one of said cylinder-engaging parts being rigidly connected to the head in the
H'' Contd direction of load thrust from the connecting rod, the opposite cylinder-engaging part being yieldable relative to the head in response to cylinder wall pressure, whereby thermal expansion of said piston will not cause it to seize in the cylinder during operation.—

Per I 45. 43 A piston for an internal combustion engine cylinder, comprising a head portion carrying packing means and an integral guide portion
Per I integral with the head portion and having diametrically opposite cylinder-engaging parts ~~for receiving thereof designed to receive~~ side thrust from a connecting rod, one of said cylinder-engaging parts being slit longitudinally to render it materially more yielding than the opposite cylinder-engaging part.—

(Sig)

—9— 204661—112

Serial No. 204,661 12470

REMARKS

Subject to the consent of the Examiner, applicant has requested correction of the drawings in accordance with the accompanying letter.

The title of the invention has been changed from "Hydrocarbon Motors" to "Pistons", which is believed

to be a more appropriate title for the invention disclosed.

Certain formalities have been corrected in the specification.

The statement of the particular object set out in lines 14 and 15 is misleading, because the rigidity of the connection referred to from the bosses to the skirt walls is in the direction of mechanical load thrust from the connecting rod to the main bearing face of the piston skirt. This statement was interpreted by the courts in Interferences 49,575, 49,569 and 49,570 as meaning rigidity in the direction of load thrust on the piston body and not a rigid internal supporting structure that would prevent expansion and contraction of the piston skirt in response to cylinder wall pressure. See Long v. Gulick 17 Fed. (2d) 686 and United States Court of Customs and Patent Appeals decisions in Patent Appeal Docket Nos. 2608 and 2609. This amendment is made in accordance with those decisions and to render the statement of the object consistent with the remainder of the specifications and the drawings.

This application contains claims 1 to 44 17 inc, 19 to 24 inc, and 26 to 45 inc, inclusive. Claims 1, 3 to 13 inclusive, 15, 23, 24 and 29 to 32 inclusive are officially allowed. The status of the remaining claims will be taken up in the consecutive order of their numbering.

Serial No. 204,661. 12471

In considering the question of invention involved in the Gulick disclosure, the patents to Ebbs, Spillman & Mooers, and Derby and Kaiser were taken as representative of the prior art and were particularly discussed in judgments handed down in certain of the interferences. The judgment in Interference No. 49,573 handed down by the Law Examiner on April 4, 1924, involving claim 1 of Gulick as the issue, reads in part as follows:

> "The patent to Derby et al does not meet the count because the skirt formed by section 10 is not slit at one side between its connection to the pin bosses, on side members 2 of the frames, Fig. 6. As shown in Fig. 5, the split at the upper and lower sides of the skirt comes directly opposite the connection to and is not between the connection to the bosses.

The Spillman patent lacks the split in the skirt 2 and the pin bosses 12 are not connected to the upper part of the skirt. If it is conceded that there is no invention broadly in splitting the skirt of the Spillman piston after the disclosure in the Ebbs and Derby patents, which seems reasonable, the Spillman patent still falls short of anticipating the count. The idea of connecting the pin bosses of Spillman to the upper part of the skirt is not clearly suggested by Derby et al or Ebbs.

The Ebbs patent does not show pin bosses connected to the upper and lower parts of skirt f. The count calls for a plurality of pin bosses and the connections of the pin bosses to the skirt are separated since the split lies between them. The crosshead would not be the full equivalent of a pair of pin bosses in the relation defined in the count. If the crosshead c is considered the equivalent of a plurality of pin bosses, the crosshead c is connected to the central portions of the entire skirt f and not to the upper and lower parts of the skirt. The tubular bushing in crosshead c is not considered to be a pin boss, or the equivalent of a plurality of pin bosses."

The Law Examiner's decision of April 4, 1924 in Interference No. 49,576, involving Gulick claim 12 as the issue, reads in part as follows:

"The first missing limitation would require connecting flanges between the pin bosses 12 and the skirt 2 of the patent substantially above the connections shown in Figures 2 and 3 and in a zone or circumferential belt which would include the bosses. This is a material limitation having a useful function.

Serial No. 204,661. 12472

The second missing limitation is not new in itself since the Ebbs patent shows a longitudinal split in the skirt, but in cooperation with other elements not found in the Ebbs patent, it is a part of a new combination. It is noted that the claim was allowed to Gulick by the primary examiner after consideration of both patents cited.

The count is not satisfactorily anticipated by either reference or any reasonable combination of the references."

The following prior art has been specifically considered in connection with this application:

Ebbs	Patent No.	700,309	74-108- 9	Dated	May	20, 1902
Stadel		753,527	74-108- 2		March	1, 1904
Marcil		920,165	74-108- 4		March	4, 1909
Nichols		953,389	74-108- 2		March	29, 1910
Van Bever		1,031,212	74-108- 9		July	2, 1912
Derby & Kaiser		1,053,790	74-108- 9		Feb.	18, 1913
Knight		1,061,756	74-108- 9		May	13, 1913
Spillman et al.		1,092,870	74-108- 9		April	14, 1914
Barthel		1,139,396	74-108-10		May	11, 1915
Ayers		1,147,915	74-108-11		July	27, 1915
Franquist		1,153,902	74-108- 9		Sept.	21, 1915
Vincent		1,279,184	74-108- 9		Sept.	17, 1918
French Patent to Chenard & Walcker	No.	468,595	74-108-10	Dated	July	19, 1914
British Patent to Birmingham	No.	21,435	" " 6	"	Sept.	15, 1910
British Patent to Rainforth	No.	6,826	" " 9	"	June	20, 1912
British Patent to Thomas	No.	1,411	" " 11	"	June	13, 1914

Gulick proved reduction to practice of his invention in 1914. See, for instance, the decision handed down on June 3, 1929 by the Board of Appeals in Interference No. 49,571 wherein it was held that:

> "We also concur in the opinion of the Examiner of Interferences that Gulick proved reduction to practice in 1914."

The following patents are not references against Gulick in view of his filing date and date of reduction to practice in 1914, as determined in these interferences. They are listed here for convenience and to show that they have been considered. They are as follows:

Serial No. 204,661. 12473

	Patent No.	*Filed*	*Granted*	
Schoengarth	1,174,092	Oct. 1, 1915	March 7, 1916	74-108- 9
Haas	1,229,258	Apr. 1, 1915	June 12, 1917	" " 11
Ricardo	1,294,833	Apr. 23, 1918	Feb. 18, 1919	" " 9
Spillman	1,325,176	Feb. 12, 1919	Dec. 16, 1919	" " 8
Br. to Ricardo	17,963		Dec. 23, 1915	" " 9
Fr. to Panhard	480,650		Aug. 31, 1916	" " 9

Claim 2 has been amended to include the limitation that the skirt is split longitudinally between its connections to the wrist pin bosses. The combination now recited in the claim was decided to involve patentable novelty by the Law Examiner in his consideration of claim 1 in Interference No. 49,573, that is quoted above.

Since new function results from the combination of elements now recited, the claim should be allowed.

Allowed claims 4 and 5 have been amended to complete the combination of elements recited in the claim and to bring these claims into harmony with the Law Examiner's decisions with respect to claims 1 and 2.

Allowed claims 6 and 7 have been amended to specify that the flanges extending laterally from the boss are yieldable in the direction of the wrist pin axis and relatively rigid in the direction of their length.

Claims 14 to 22 inclusive were objected to on the ground that the skirt of the Gulick piston was not *divided* into "parts, sections or portions." (Examiner's letter of Oct. 6, 1922.) An explanation of the fact that internal combustion engine pistons have well defined thrust faces on opposite sides of the piston body and that the claims did not specify the actual dividing or separation of the piston skirt along these lines, apparently satisfied the Examiner, because he declared the interferences involving claims 15 and 32, wherein the same limitation appears. Moreover, the Court of Customs and Patent Appeals considered this limitation in claim 32 in Interference No. 49,569, Patent Appeal No. 2608. The Court said:

> "It is first contended by Hartog that Gulick's guide structure does not meet the term "comprising diametrically opposite cylinder engaging parts." In this we think appellant is in error since the combination in Gulick certainly has cylinder engaging parts which are diametrically opposite to each other —that is to say, there are parts of the skirt of the piston which engage the cylinder and which are opposite each other. Hartog argues that, since Gulick has but one slit, there is, therefore, but one cylinder engaging *part* in Gulick's disclosure."

These claims 14 and 16 to 22, inclusive, were not rejected on references and are believed to be clearly allowable as originally presented. Certain of these claims have been amended to add limitations thereto.

Claim 14 as now presented, also includes an annular bearing surface at the open end of the skirt, and integral rigid connections from the bosses to the piston head.

Claim 16 has also been amended to specify that the longitudinal split in the piston skirt is located between the connections thereto of the walls joining the bosses and the skirt.

Claim 17 has been amended to specify that the connections from the guide portions of the bosses are transversely flexible, which alone distinguishes from the prior art as to the yielding characteristics of these connections.

Claim 18 has been rewritten as claim 34 in order to improve its form, and to further define the position of the longitudinal split as positioned between the connections of the skirt to the bosses. The elements of the claim have been re-arranged to improve its form.

Claims 20 and 21 have been amended to specify that the longitudinal split in the skirt wall is disposed between the spaced supporting connections for the skirt.

Claim 25 has been cancelled without prejudice because the same general subject matter is covered in other allowed claims and claim 25 appears unnecessary to full commercial protection of the invention.

Claims 26 and 27 have been further amended to define the location of the longitudinal split in the skirt as disposed between the connections of the bosses to the skirt. This is allowable subject matter, as indicated in the Law Examiner's decision.

Claim 28 is more detailed than claim 29, that was involved in Interference No. 49,588 and should be allowed. This claim also specifies a single longitudinal slot in the skirt between the connections to the head. It also specifies that the opposite side of the piston skirt is circumferentially continuous between the connections to the head. The side thrust from the connecting rod is very great during the power stroke of the piston and this construction provides a continuous bearing face for receiving this thrust. The longitudinally slit side of the skirt renders the skirt yielding in response to cylinder wall pressure on the main bearing face of the piston that receives the angular thrust from the connecting rod on the compression stroke. This thrust is much smaller than the thrust during the power stroke and therefore the slit skirt wall is capable of receiving it without danger of undue yielding or collapse. These are all important limitations not found in the prior art that give rise to new functional results.

Claim 33 has been amended to define the location of the longitudinal split as disposed between the connections from the bosses to the skirt and is clearly allowable in accordance with the previously quoted decision of the Law Examiner in connection with claim 1.

Serial No. 204,661 12476

Newly presented claims 35 to 44 45 are more restricted than certain of the previously allowed claims, and are presented in order to obtain more detailed protection on certain elements of the invention.

Claim 35 is limited to a piston in which one of the main bearing portions of the skirt is circumferentially continuous between the supporting connections to the bosses, whereas the other main bearing face is longitudinally split between its connections to the bosses. The improved functioning of the piston is also stated in the claim. This clearly distinguishes from the art and from previously proposed claims. This also applies to claim 36, wherein the split is defined as extending the entire length of the skirt.

Claim 37 specifies a yielding connection between the skirt and the piston head. The claim also specifies that only one side of the skirt is split its entire length between its connections to the head. This claim is more detailed than allowed claim 30 that was involved in Interference No. 49,570 and is believed to be clearly allowable.

Claim 38 specifies that the longitudinal split in the piston skirt is positioned in one of the main bearing faces to thereby render the skirt resiliently yieldable in response to pressure from the cylinder wall during operation. This is believed to distinguish essentially from the prior art. The longitudinal split in the skirt of the Ebbs piston is in the plane of the wrist pin axis and not in a main bearing face. Furthermore, the Ebbs piston could not be cut through its skirt in a main bearing face because the boss structure of the piston extends completely across the piston on this diameter. The Ebbs piston, furthermore, could not be so split as to render it resiliently yieldable in response to cylinder wall pressure.

Serial No. 204,661 12477

Claim 39 specifies that the skirt of the piston is yieldable in response to cylinder wall pressure and yieldingly engages the cylinder wall during operation. This

claim further specifies a yielding connection between the skirt and the head of the piston that permits yielding of the skirt in response to cylinder wall pressure. This claim also specifies a connection between the wrist pin bosses and the skirt that is rigid in the direction transverse to the wrist pin, which is in the direction of side thrust from the connecting rod. These limitations distinguish in these important particulars from all of the prior art.

Claim 40 specifies that only one of the main bearing portions of the piston skirt is slit longitudinally between its connections to the bosses and that both sides of the skirt have the transverse slits separating the head from the skirt. This claim is more detailed than claim 1 in certain particulars, but it does not specify that the skirt is separated from the head around its entire periphery in order to cover certain of the constructions reduced to practice by Gulick during his development of the general invention. This claim also specifies that the longitudinal slit in the skirt is in one of the main bearing faces and that only one main bearing face is slit.

Claim 41 specifies that the skirt wall is separated from the head around its entire periphery, that it is longitudinally slit to render the skirt wall yieldable on every diameter, and means rigidly connecting the bosses to the head and yieldingly connecting the bosses to the skirt. This same group of distinguishing limitations do not appear in other claims submitted and they essentially distinguish from the references. Ebbs is not

yieldable over the diameter parallel with the boss axis or in response to cylinder wall pressure. The Franquist skirt wall is not yieldable along the boss axis and the skirt wall is not slit as required by the claim.

Claim 42 specifies that the connection from the bosses to the skirt is yieldable along the boss axis and rigid transversely of the axis. This claim also specifies that the skirt is longitudinally slit and separated from the head on at least one side and is yieldable on every diameter. These limitations distinguish from the prior art patents.

Claim 43 specifies that the skirt is longitudinally slit between the bosses and separated from the head. This claim further specifies that the cylinder-engaging wall on one side of the bosses is non-yielding circumferen-

tially, whereas on the other side of the skirt it is longitudinally slit. The connection of the bosses to the skirt are further described as non-yielding in the direction transverse to the bosses. These distinctive elements are not found in any of the prior art disclosures and the combination specified in the claim distinguishes from the other claims submitted.

Claim 44 specifies that the cylinder-engaging part of the piston on one side is rigidly connected to the head in the direction of load thrust and that the opposite cylinder-engaging part is *yieldable* relative to the head in response to cylinder wall pressure. This combination is not shown in any of the prior art considered. Ebbs is rigid and non-yielding on both thrust faces of the piston, so that neither face yields in response to cylinder wall pressure. Franquist is yieldable on each bearing face, so that neither can be construed as rigidly connected to the head. In piston construction it is essential that the load thrust, which is very great, be transmitted from the head to a bearing face of the piston without yielding of the piston structure, which would cause the

axis of the piston to swing out of line with the axis of the cylinder. Gulick recognized this and split only one side of the piston. The cylinder bearing part of the piston that takes the side thrust during the compression stroke of the connecting rod only carries a fractional part of the load on the opposite thrust face and therefore this face was slit and made to yield by Gulick. Applicant believes that this claim is clearly allowable.

Claim 45 specifies that one of the cylinder-engaging parts of the guide portion which receives the side thrust from the connecting rod is split longitudinally to render it more yielding than the opposite cylinder-engaging part. This combination is not disclosed in any of the prior art patents considered. Franquist is yieldable to the same extent on its opposite thrust faces and Ebbs is non-yielding on its opposite thrust faces. Applicant believes that this claim is clearly allowable.

Each of the claims now presented has been carefully considered and is believed to patentably distinguish from the prior art. The claims also distinguish from

each other in important particulars. Allowance of the application as now submitted is respectfully requested.

Respectfully submitted,

EDWARD J. GULICK,
By EVANS & MCCOY,
Attorneys.

Cleveland, Ohio
April 3, 1931
WCM/LR

—19— 204661—122

(Mailed Apr 24 1931)

Div. 12 Room 380 4-E Paper No. 51

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name

All communications respecting this application should give the serial number, date of filing and name of the applicant

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
Washington

Please find below a communication from the Examiner in charge of this application.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Evans & McCoy,
724 Bulkley Bldg.,
Cleveland, Ohio.

Applicant: Edward J. Gulick
Ser. No. 204,661
Filed Nov. 30, 1917
For Pistons.

Responsive to the amendment of April 4, 1931.

The following claims remain in this case: 1 to 17, inclusive, 18 to 24, inclusive, and 26 to 45, inclusive.

The following claims may be allowed: 1 to 13, inclusive, 15, 23, 24, 26, 28 to 33, inclusive, and 43.

Claims 14, 16, 17 and 19 to 22, inclusive, together with claims 27, 34 to 40, inclusive, and 42, 44 and 45 are rejected for the reasons specified in the Office action of October 6, 1922 (Paper No. 12). Amplifying the reasons contained in that rejection it is desired to add that while it is proper in a case, where a mechanism has a part which performs an independent function, to claim both the mechanism and the part, as independent elements (*ex parte Duncan et al*, 124 O. G. 1207), yet such is not the case here. As heretofore stated, applicant has only a single skirt section and by separately reciting different parts of that skirt as independent elements he necessarily would include that type of piston in which the skirt is formed of separate slipper sections, which is something this applicant did not have in mind at the time the case was filed, or, at least, which is beyond anything disclosed in this application.

In other words, and to use Judge Tuttle's simile in *Bindley vs. Detroit River Tunnel Co., et al.* (253 F. R.,

751) an applicant may not properly, like Balboa when he discovered the Pacific, claim "not only what he can see, but make broad and sweeping claims, assuming no one else has any rights"; but rather must, like our Pilgrim Fathers, "settle down on a little patch and carefully fence it around, to indicate just what belongs to them."

Of course applicant is entitled to as broad claims as the art will stand, but such a claim must necessarily be within the limits of applicant's invention as described in his specification and illustrated by his drawing. As was stated in *Burroughs Adding Machine Co., vs. Felt and Tarrant Mfg. Co.*, 243 F. R. 861, 870, it is—

> "a fundamental and controlling rule that a patentee's broadest claim can be no broader than his actual invention, no matter how it may be expressed or what other claims his patent may contain. When a patentee has fully and clearly described his actual invention in the specification and drawings of his patent, and has fully covered that invention by the broadest claim to monopoly which the law will allow him, he cannot then, by merely including in his patent a more broadly or more vaguely stated claim, cover and monopolize something more than and different from his real invention."

To state this matter in another way, the question raised by presenting the claims now rejected is the same as was raised in the case of *State Bank of Chicago v. Hillman's*, 180 F. R. 732, and is this: Can an applicant rightfully include in his claims something that does not emerge from his description? The Examiner thinks not. To hold otherwise would enable an applicant to use his disclosure of a definite, tangible thing as a basis on which to draw claims which are inflated and expanded to cover wholly dissimilar devices which are in nowise the mechanical equivalents of the definite thing disclosed in the application. As was stated by the Court in the case cited:

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"The description is required to set forth the invention in such full, clear, concise and exact terms as to enable any person, skilled in the art to which it appertains, or with which it is most nearly connected, to make and use the same; and the claim is to enable the public to know the bounds and scope of the invention 'thus disclosed'; but 'any claim which is broader than the described invention, is void; even where that invention is valuable, and could have supported a valuable claim.' *Walker on Patents* (4th Ed.) 177, citing *Edison v. American Mutoscope Co.*, 114 Fed. 934, 52 C. C. 546."

Furthermore, while the Examiner does not entertain any doubt as to the correctness of the foregoing rejection, yet it is well settled that in a case which has been pending in the Office for a number of years, every doubt as to applicant's right to make claims of the nature rejected should be resolved against him. (*Ex parte Pope*, 222 O. G. 1055 and *ex parte Fripps*, 227 O. G. 737). And this working rule would appear to be especially applicable where the Office has reason to believe that patents have been granted containing claims drawn specifically to devices which are different, both in function and structure, to the one disclosed in the application under consideration, and claims are presented in such application worded in such manner as to dominate the patented devices.

It is noted that this case has been pending since November 30, 1917, and that applicant has had ample opportunity to present and have considered all claims and arguments he desires. The Examiner has no new

reasons or references to present, and this action is accordingly made *final*. See *ex parte Poulson*, 175 O. G. 365, 1912 C. D. 38, the decisions referred to therein, and *ex parte Jackson*, 353 O. G. 5, 1926 C. D. 102. The Examiner will admit any amendment, if presented within

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the statutory period, which will enable him to pass this case for issue, but will not admit any amendment which will not accomplish this result. Such amendments as properly accompany an appeal may, of course, be entered if presented in accordance with the second paragraph of Rule 68.

Claim 42 is also rejected, along with claim 41, on Spillman and Ebbs, both of record, for the reasons set forth in the Office action dated January 30, 1922, (Paper No. 10). If applicant appeals he should furnish an affidavit under Rule 48 to the effect, that the cylinder exerts pressure on the piston.

Claims 1 to 13, inclusive, 15, 23, 24, 26, 28 to 33, inclusive, and 43 may be allowed.

Claims 14, 16, 17, 19, 20, 21, 22, 27, 34 to 43, inclusive, and 44 and 45 are *finally* rejected.

C. C. Henry,
Examiner.

H.W.F.G. 204661—126

(U. S. Patent Office May 2-1931 Division 12, Paper No. 52)
(Mail Division Apr 30 31 U. S. Patent Office)

IN THE UNITED STATES PATENT OFFICE

Application of:
Edward J. Gulick
Serial No. 204,661
Filed Nov. 30, 1917
For—Pistons
Division 12.

Not ent.
W. G.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In the matter of the above entitled application, and in response to Patent Office Letter of April 24, 1931, please amend as follows:

Claim 14, line 4, after "parts" insert —*thereof designed*—

Claims 16, 17, 19 and 21, at the end of line 3 of each of these claims insert —*thereof designed*—

Claim 20, line 4, after "parts" insert —*thereof designed*—.

Claim 22, line 3, after "parts" insert —*thereof designed*—;

Claim 27, line 4, after "parts" insert —*thereof designed*—.

Claim 34, line 4, cancel "for receiving" and insert —*thereof designed to receive*—

Claim 35, line 2, cancel "having", and insert: —, *parts of said skirt forming*—

line 2, at the end of the line insert —*designed*—

Claim 36, line 2, cancel "having" and insert: —, *parts of said skirt forming*—

Ser. No. 204,661.

Claim 37, line 4, after "skirt" insert —*being integral and*—

Claim 38, line 4, after "said skirt" insert —*being integral and*—

line 5, cancel "arranged" and insert —*designed*—

Claim 39, line 3, after "slitted" insert —*one piece*—

Claim 39, line 6, cancel "arranged" and insert —*designed*—

Claim 40, line 4, after "said skirt" insert —*being integral and*—

line 5, cancel "arranged" and insert —*designed*—

Claim 42, line 4, after "said skirt" insert —*being integral and*—

Claim 44, line 2, before "guide portion" cancel "a" and insert —*an integral*—

line 3, cancel "for receiving" and insert —*thereof designed to receive*—

Claim 45, line 2, before "guide" cancel "a" and insert —*an integral*—

line 4, cancel "for receiving" and insert —*thereof designed to receive*—

REMARKS

Applicant has carefully considered the Examiner's objection to the terms used in certain of the rejected claims and he has amended these claims to overcome these objections. The "cylinder-engaging parts" recited in the claims are now carefully defined as parts of the guide portion of the skirt. This change also brings the statement of the claims clearly within the wording approved by the Court in connection with this applica-

tion in Patent Appeal 2608, 47 F. (2) 365 wherein it was held that—

> "* * * the combination in Gulick certainly has cylinder engaging parts which are diametrically opposite to each other * * *"

The objectionable terms "for receiving" the angular thrust from the connecting rod have been changed to define these parts as "designed to receive" the thrust from the connecting rod. It is believed that these changes materially improve the statement in the claims and that they overcome the Examiner's objections to the previously used wording of the claims. These claims define structure that is not found in the prior art and are now believed to be allowable.

Reconsideration of the Examiner's rejection of claims 41 and 42 on the Spillman & Ebbs constructions is requested in view of the inherent non-yielding characteristics of both of these constructions when they are subjected to cylinder wall pressure by reason of thermal expansion of the piston in an engine cylinder during operation. In Ebbs, the bearing parts "f" are rigidly carried by the heavy metal cross-head "c." Any thermal expansion of this cross-head would carry the bearing parts outwardly and result in seizing of the piston. This is also true of the Spillman construction. No combination of these references, with the addition of modifications that materially change the inherent functional characteristics of the original structures is warranted when such modifications are not even remotely suggested by either reference.

As now presented, claim 41 specifies that the skirt must be so slit as to render it "yieldable on every diameter in response to cylinder wall pressure." This claim also specifies that the bosses are yieldingly connected to

the skirt so that the skirt is yieldable in response to cylinder wall pressure. Gulick was the originator of this character of piston and is believed to be entitled to this

Ser. No. 204,661.

claim. This claim closely parallels allowed claim 30 that was involved in Patent Appeal 2609, 47(2) 367.

In addition to the limitations appearing in claim 41, claim 42 specifies that the means connecting the bosses with the skirt is yieldable in the direction of the boss axis and is rigid in the direction of thrust from the connecting rod which is transverse to the boss axis. Gulick was the first to appreciate the importance of a piston construction that would receive the explosion thrusts on the skirt through webs that were non-yielding in the direction of the explosion thrusts in combination with a skirt that could yield in response to cylinder wall pressure caused by thermal expansion of the piston body. The importance of this relationship has been emphasized time and again in the decisions relating to the Gulick disclosure and the pioneer nature of this invention warrants the broad protection defined in these claims.

The affidavit under Rule 48 will be provided in due course.

Respectfully submitted,

EDWARD J. GULICK,
By EVANS & MCCOY,
Attorneys.

Washington, D. C.,
April 30, 1931.

(Approved May 2 1931 C. C. Henry, Examiner, Div. 12)

May 16 Paper #53

(Mail Division May 15 31 U. S. Patent Office)

(Issue Division May 18 1931 U. S. Patent Office)

IN THE UNITED STATES PATENT OFFICE

Application of
Edward J. Gulick
Serial No. 204,661
Filed November 30, 1917
For Pistons
Div. 12, Room 380.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In further response to Patent Office Letter of April 24, 1931, applicant is submitting herewith an Affidavit under Rule 48, setting forth the fact that under normal operating conditions the piston shown and described in the foregoing application is subjected to pressure from the cylinder wall, and that this was known to applicant at the time the invention was made. The remainder of the affidavit is the usual form of supplemental oath.

It is now believed that the claims of this application are in condition for allowance, since the amendments made in the claims of the application were believed to comply with the Examiner's suggestions at the time of counsel's interview with the Examiner about the time of filing the last amendment.

Respectfully submitted,

EDWARD J. GULICK,
By EVANS & MCCOY,
Attorneys.

Cleveland, Ohio
May 14, 1931
WCM/LR

204661—131

(Mail Division May 15 31 U. S. Patent Office)
(Issue Division May 18 1931 U. S. Patent Office)

Paper # 53

IN THE UNITED STATES PATENT OFFICE

Application of
Edward J. Gulick
Serial No. 204,661
Filed Nov. 30, 1917
For Pistons
Div. 12, Room 380.

SUPPLEMENTAL OATH

STATE OF INDIANA }
COUNTY OF ELKHART } ss.

Edward J. Gulick, whose application for Letters Patent for an improvement in Pistons, Serial No. 204,661, was filed in the United States Patent Office on or about the 30th day of November, 1917, being duly sworn, deposes and says:

That the piston shown and described in the aforesaid application is normally fitted in the engine cylinder with an operating clearance; that thermal expansion of the piston during operation normally causes the engine cylinder to exert pressure on the piston body; that this fact was known to him at the time he made his invention disclosed in the aforesaid application for Letters Patent; and that the subject matter of each of the following claims now in this application was part of his invention, was invented before he filed his original application above identified for such invention, was not known or used before his invention, was not patented or described in a printed publication in any country more than two years before his application, was not patented in a foreign country on an application filed by himself or his legal representatives or assigns more than twelve months before his application, was not in public use or on sale in this country for more than two years before the date of his application, and has not been abandoned:

Serial No. 204,661

1. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.

2. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses integrally connected to the head and to the upper and lower part of the skirt, the outer ends of the pin bosses being spaced from the opposing parts of the skirt wall and said skirt having openings opposite the open ends of the bosses, said skirt being slit longitudinally on one side between its connections to said bosses.

3. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses integrally connected to the head and to the skirt in four longitudinal lines, the ends of said bosses being spaced from the opposing parts of the wall of the skirt, said skirt having openings therethrough opposite the open ends of the bosses.

4. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and also connected to the skirt both above and below the bosses, said skirt being split longitudinally between its connections to said bosses.

5. An integrally cast piston comprising a head, a skirt separated at its periphery from the head, and pin bosses integrally connected to the head and to the skirt at both sides and in the zone of said bosses, the bosses having their ends spaced from the opposing parts of the skirt wall, said skirt being split longitudinally between its connections to said bosses.

Serial No. 204,661

6. An integrally cast piston comprising a head, a skirt, separated piston pin bosses within the skirt, and an integral flange on each of said bosses intermediate its ends, said flange extending from both sides of the boss to the piston skirt and integrally united therewith in the zone of the boss, said flanges being yieldable in the direction of the piston pin boss axis and relatively rigid in the direction of their length.

7. A piston comprising a head, a skirt, separated piston pin bosses integral with the head and disposed within the skirt, and integral transversely flexible webs extending from the intermediate part of each of said bosses to the skirt wall in the zone of the boss for supporting the bosses from the adjacent part of the skirt.

8. A piston comprising a head, a skirt having its periphery separated from the head, pin bosses in the piston spaced from the wall of the skirt and conduits leading from the top of said skirt to the interior of said bosses.

9. A piston comprising a head, a skirt having its periphery separated from the head, pin bosses in the piston, the ends of such bosses being spaced from the walls of the skirt, means integrally connecting the bosses with the head and skirt, and pipes leading from the upper part of the skirt to the bosses.

10. A piston comprising a head, a skirt, separated piston pin bosses within the skirt, and an intermediate flange on each of said bosses intermediate its ends, said flange extending laterally from both sides of the boss to the piston skirt in a curve and integrally united with the skirt in the zone of the boss.

Serial No. 204,661

11. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

12. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction, and the skirt portion being cut away adjacent the outer ends of the piston bosses.

13. A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

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Serial No. 204,661

14. A piston for internal combustion engines comprising in combination a head portion having an end wall and a ring-packed side wall, a guide portion having an annular bearing surface at the open end thereof and diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall of the head portion by an unobstructed air gap, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of longitudinally disposed walls connected to said bosses and each joined at relatively widely separated points to the said cylinder-engaging parts above and below the plane of the boss axis, said walls being disposed within the maximum diameter of the piston, and integral, rigid connections extending from the bosses to the head portion.

15. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

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Serial No. 204,661

16. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air

gap and one of said cylinder-engaging parts being split longitudinally from its upper edge to its lower edge, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, and walls integrally uniting said bosses, the guide portion and the head portion, said split in the cylinder-engaging face of said guide portion being disposed between the connections thereto of said walls.

17. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and arcuate cylinder-engaging parts joining said diametrically opposite parts at the lower end of the guide, the said diametrically opposite parts each being separated at its upper end from the side wall of the head section by an air gap, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of transversely flexible walls integrally connected to said bosses and integrally joined to the cylinder-engaging parts at points above and below the plane of the boss axis, said walls being disposed within the maximum diameter of the piston, and connections extending from the bosses to the head portion and integral therewith.

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19. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air gap, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of walls connected to said bosses and joined to the said cylinder-engaging parts at points above and below the plane of the boss axis, and rigid, integral connections between the bosses and the head portion comprising upward extensions of said walls with strengthening ribs disposed substantially at right angles thereto.

20. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take

the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air gap, spaced supporting connections between said head and guide portions, one of said cylinder-engaging parts being split longitudinally from its upper edge to its lower edge between said supporting connections, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of walls disposed within the maximum diameter of the piston and integrally connected to said bosses and to said cylinder-engaging parts and to said head portion.

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Serial No. 204,661

21. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said wall by an air gap and one of said cylinder-engaging parts being split longitudinally from its upper edge to its lower edge, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, and walls integrally uniting said bosses, the guide portion and the head portion, the guide structure and said walls being adapted to permit the split of the cylinder-engaging part to close more or less under the action of forces incident to the heating of the piston during operation.

22. A piston comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air gap, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of walls connected to said bosses and to said cylinder-engaging parts, and connections extending from the bosses to the head section, one of the said cylinder-engaging parts being split longitudinally between the points of attachment thereto of the said walls.

23. In a piston, the combination of a head portion having an end wall and a side wall, a guide portion, a pair of separated piston pin bosses connected to the head portion, and webs disposed longitudinally of the piston in-

tegrally joining the inner parts of said bosses to the guide portion in the zone of said bosses.

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Serial No. 204,661

24. A piston for internal combustion engines comprising a head portion, a guide portion, a pair of separated pin bosses connected to the head portion and arranged within the maximum diameter of the piston whereby the outer ends of the bosses will be out of contact with the cylinder wall, and a flange on each of said bosses near its inner end extending laterally from both sides of the boss to the guide portion in a curve and integrally united with the guide portion in the zone of the boss, said flange being disposed longitudinally of the piston.

26. An integrally formed piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a pair of separated pin bosses, and a guide portion connected to said bosses and having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall of the head portion by an air gap and being split longitudinally between its connections to said bosses to accommodate expansion incident to the heating of the piston.

27. An integrally formed piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a connecting rod and each separated at its upper end from the said side wall by an air gap, spaced supporting connections between said head and guide portions, one of said cylinder-engaging parts being split longitudinally between its supporting connections from its upper edge to its lower edge, and a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts.

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28. A one-piece piston with a solid end portion and a skirt portion supported therefrom by spaced integral connections and having formed in its peripheral face a transverse slot adjacent the solid end of the piston and a

single longitudinal slot in the skirt between the spaced integral connections and extending from the transverse slot to the open end of the piston, said slots forming adjacent disconnected main peripheral bearing portions in the skirt which are capable of unrestrained outward and inward movement, the bearing face of said piston diametrically opposite said longitudinal slot being circumferentially continuous between the spaced integral connections of the skirt to the head on that side of the skirt.

29. A one-piece piston provided with a solid end portion and a skirt portion, said skirt portion having oppositely disposed thrust bearing faces and a longitudinally extending slot formed through the thickness of its wall, said slot extending from the rear edge of the skirt portion through one of said thrust bearing faces and forming adjacent disconnected parts of a thrust bearing face in said skirt portion which are capable of being moved inwardly or outwardly without restraint.

30. A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

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31. A piston open at one end and having a packing ring supporting portion and a cylinder-engaging portion, said cylinder-engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion and separated from said cylinder-engaging portion, and tying means extending from each of said wrist pin bearings, each being cooperably connected at their opposite ends to said cylinder-engaging portion.

32. A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

33. A piston closed at one end and open at its opposite end, said piston having an annular cutting formed through the thickness of its peripheral wall, thereby providing a separated sleeve-like skirt which is approximately cylinder-bearing in its entirety, a pair of wrist pin bearings depended from said piston end and being free from engagement with said skirt, supporting means extending from each of said bearings to said skirt, said skirt being provided with a longitudinal slot cut through the thickness of its wall between its connections to said supporting means and extending from the open end thereof to said annular cutting.

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34. A piston for an internal combustion engine cylinder comprising in combination, a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to receive the side thrust of a connecting rod and arcuate cylinder-engaging parts joining said diametrically opposite parts at the lower end of the guide portion to provide an annular bearing face adjacent the open end of the piston, each of said diametrically opposite cylinder-engaging parts being separated at its upper end from the side wall of the head portion, a pair of separated pin bosses disposed on an axis between said cylinder-engaging parts, a pair of spaced walls, each of which connects one of said bosses to said cylinder-engaging parts at points above and below the plane of the boss axis, one of said diametrically opposite cylinder-engaging parts being split longitudinally from its upper edge to its lower edge between its connections to said walls, and connections extending from the bosses to the head portion, whereby said piston skirt is rendered yieldable during operation in response to cylinder wall pressure.

35. A piston for use in an engine cylinder comprising a head, a skirt, parts of said skirt forming oppositely positioned main bearing portions designed to take the side thrust of a connecting rod, a pair of spaced wrist pin bosses, means integrally connecting the bosses to the head, and means integrally connecting each boss to both of said opposite main bearing portions, one main bearing portion being circumferentially continuous between its connections to the bosses and the other main bearing portion being separated from the head and slit longi-

tudinally between its connections to the bosses to render said slit main bearing portion yieldable in response to pressure from the engine cylinder during operation.

—12— 204661—143

Serial No. 204,661

36. A piston for use in an engine cylinder comprising a head, a skirt, parts of said skirt forming oppositely positioned main bearing portions to take the side thrust of a connecting rod, a pair of spaced wrist pin bosses, means integrally connecting the bosses to the head, and means integrally connecting each boss to both of said opposite main bearing portions, one main bearing portion being circumferentially continuous between its connections to the bosses and the other main bearing portion being separated from the head and slit longitudinally its entire length between its connections to the bosses to render said slit main bearing portion yieldable in response to pressure from the engine cylinder during operation.

37. A single-piece, integral piston, comprising a head, a pair of spaced wrist pin bosses having a common axis, a skirt, and means yieldingly connecting the skirt to the head, said skirt being integral and having main cylinder-bearing faces disposed on opposite sides of the axis of said wrist pin bosses, said skirt being separated from the head at the upper end of each of said bearing faces, one only of said main cylinder bearing faces being slit longitudinally between its connections to the head, whereby said head may expand and contract during operation of said piston substantially independently of said skirt portion when expansion of the skirt portion is restrained.

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Serial No. 204,661

38. A single-piece, integrally cast piston for use in an engine, comprising a head, wrist pin bosses having a common axis, a skirt, and means connecting said head and bosses and skirt together, said skirt being integral and having a main bearing portion disposed on each side of the said wrist pin boss axis and designed to take the side thrust produced by the angularity of the connecting rod of the engine, said piston having a transverse slit through its wall on one side of the boss axis, portions of said skirt on the transversely slit side of the piston also being slit longitudinally between its connections to

said bosses to provide a peripheral main bearing portion in the said transversely slit side of said piston that is capable of yielding in response to pressure from the engine cylinder during operation of the piston.

39. A single-piece, integral piston for operation in an internal combustion engine cylinder, comprising a head, spaced wrist pin bosses, a longitudinally slitted, one-piece skirt that is yieldable in response to cylinder wall pressure having cylinder-engaging faces disposed at opposite sides of the axis of said bosses and designed to yieldingly engage the walls of the cylinder during operation, said head and skirt being separated at the upper end of each of said cylinder-engaging faces, and means yieldingly connecting the skirt to said head including means connecting the bosses and the skirt, said means connecting said bosses and said skirt being substantially rigid in the direction transverse to the axis of the bosses, whereby said head portion may expand and contract during operation of said piston without binding engagement of the skirt with the walls of the cylinder.

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40. A single-piece, integrally cast piston for use in an engine, comprising a head, wrist pin bosses having a common axis, a skirt, and means connecting said head and bosses and skirt together, said skirt being integral and having a main bearing portion disposed on each side of the said wrist pin boss axis and designed to take the side thrust produced by the angularity of the connecting rod of the engine, said piston having a transverse slit through its wall on both sides of the boss axis, one only of said main bearing portions being slit longitudinally between its connections to said bosses to provide a peripheral bearing portion therein that is capable of yielding outward and inward movement relative to the head during operation of the piston.

41. A piston for an engine cylinder comprising a skirt, a head separated from the skirt wall around its entire periphery, said skirt being longitudinally slit to render the skirt wall yieldable on every diameter in response to cylinder wall pressure, wrist pin bosses, and means rigidly connecting said bosses to the head and yieldingly connecting said bosses to the skirt whereby said skirt is yieldable in response to cylinder wall pressure.

42. A piston for an engine cylinder comprising a cylindrical skirt that is longitudinally slit and yieldable on every diameter in response to cylinder wall pressure, a pair of wrist pin bosses having a common axis, said skirt being integral and having a main cylinder bearing portion on each side of the axis of said wrist pin bosses, a head peripherally separated from at least one of said main cylinder-bearing portions, and means connecting the bosses with the skirt, said means being yieldable in the direction of the boss axis and substantially rigid in the direction transverse to said axis, whereby said head may freely expand and contract during operation of the piston when expansion of the skirt is restrained.

—15— 204661—146

Serial No. 204,661

43. A piston comprising a head, a pair of spaced wrist pin bosses rigidly carried by the head and having a common axis, a skirt that is separated from the head on each side of the wrist pin bosses and longitudinally slit between the bosses on one side only of the bosses to render the skirt circumferentially yielding on that side of said bosses and circumferentially non-yielding on the opposite side of said bosses, and means substantially non-yielding in the direction transverse to the boss axis connecting the bosses with the skirt.

44. A piston for an engine cylinder comprising, a head, and an integral guide portion having diametrically opposite cylinder-engaging parts thereof designed to receive the thrust of a connecting rod during operation, one of said cylinder-engaging parts being rigidly connected to the head in the direction of load thrust from the connecting rod, the opposite cylinder-engaging part being yieldable relative to the head in response to cylinder wall pressure, whereby thermal expansion of said piston will not cause it to seize in the cylinder during operation.

45. A piston for an internal combustion engine cylinder, comprising a head portion carrying packing means and an integral guide portion integral with the head portion and having diametrically opposite cylinder-engaging parts thereof designed to receive side thrust from a connecting rod, one of said cylinder-engaging parts being slit longitudinally to render it materially more yielding than the opposite cylinder-engaging part.

EDWARD J. GULICK.

Sworn to and subscribed before me this 12th day of May, 1931.

WILLIAM E. WIDER,
(Notarial Seal) *Notary Public.*

Com. exp. Jan. 17/1934.

—16— 204661—147

(Mailed May 16 1931).

Div. 12 4—jte 181 Serial No. 204,661

Address only
The Commissioner of Patents
Washington, D. C.

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE

Washington May 16, 1931.

Edward J. Julick (Assor etc.)

Your Application for a patent for an Improvement in Piston filed Nov. 30, 1917 has been examined and Allowed with 43 claims.

The final fee, Twenty-Five Dollars, With $1 Additional For Each Claim Allowed In Excess Of 20, must be paid not later than Six Months from the date of this present notice of allowance. If the final fee be not paid within that period, the patent will be withheld, but the application may be renewed within one year after the date of the original notice with a renewal fee of $25 and $1 additional for each claim in excess of 20.

The office delivers patents upon the day of their date, on which date their term begins to run. The preparation of the patent for final signing and sealing will require about four weeks, and such work will not be begun until after payment of the necessary final fee.

When the final fee is paid, there should also be sent, Distinctly And Plainly Written, the name of the Inventor, Title Of The Invention, And Serial Number As Above Given, Date Of Allowance (which is the date of this circular), Date Of Filing, and, if assigned, the Names Of The Assignees.

If it is desired to have the patent issue to an Assignee or Assignees, an assignment containing a Request to that effect, together with the Fee for recording the same, must be filed in this office on or before the date of payment of the final fee.

After issue of the patent, uncertified copies of the drawings and specifications may be purchased at the price of Ten Cents Each. The money should accompany the order. Postage stamps will not be received.

The final fee will Not be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Notice.—When The Number Of Claims Allowed Is In Excess Of 20, No Sum Less Than $25 Plus $1 Additional For Each Claim In Excess Of Twenty Can Be Accepted As The Final Fee.

Respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Evans & McCoy,
724 Bulkley Bldg.,
Cleveland, Ohio.

☞ In remitting the final fee give the serial number at the head of this Notice.

☞ Uncertified checks will not be accepted.

204661—148

Jun-18-31 256460 K 1 Check—25.00
Jun-18-31 256460 K 1 Check—13.00
Rec'd U. S. Patent Office
Rec'd U. S. Patent Office

(Mail Division Jun 18 31 U. S. Patent Office)

EVANS & McCOY
PATENT LAWYERS
Bulkley Building
Cleveland

Lloyd L. Evans
William C. McCoy
Arnold C. Rood
Frank S. Greene

Telephone
Main 0470

Donald B. Waite

June 12, 1931.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

Kindly apply the accompanying final fee affecting the application designated below:

Edward J. Gulick
Serial No. 204,661
Filed Nov. 30, 1917
Pistons
Allowed May 16, 1931
Div. 12, Room 322

Patent to be issued to
The Cleveland Trust Company

Patent to be sent to
Evans & McCoy,
724 Bulkley Bldg.
Cleveland, Ohio.

Respectfully,

EVANS & McCOY.

FW
Encl.
1163
Check 38— extd
$10 Ex cl due by Nov. 16-1931
43 Claims allowed

204661—149

Jun-25-31 261757 B 2 Check—10.00
(Mail Division Jun 25 31 U. S. Patent Office)
Rec'd U. S. Patent Office

EVANS & McCOY
PATENT LAWYERS
Bulkley Building
Cleveland

June 24, 1931.

Lloyd L. Evans
William C. McCoy
Arnold C. Rood
Frank S. Greene

Telephone
Main 0470

Donald B. Waite

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

Kindly apply the accompanying check of $10.00 as balance due on final fee affecting the application designated below:

Edward J. Gulick
Serial No. 204,661
Filed Nov. 30, 1917
Pistons
Allowed May 16, 1931
Div. 12, Room 322

Patent to be issued to
The Cleveland Trust Company

Patent to be sent to
Evans & McCoy,
724 Bulkley Building,
Cleveland, Ohio.

Respectfully,
EVANS & McCOY.

ASC-c
Encl.
1163 204661—150

(Mailed Jul 8 1931)
bal.—Ex claims B.

Div. 12 Room 380 4-E Paper No. 54

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
Washington

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name

All communications respecting this application should give the serial number, date of filing, and name of the applicant

Please find below a communication from the EXAMINER *in charge of this application*

THOMAS E. ROBERTSON,
Commissioner of Patents.

Evans & McCoy,
724 Bulkley Bldg.,
Cleveland, Ohio.

Applicant Edward J. Gulick
Ser. No. 204,661
Filed Nov. 30, 1917
For Pistons.

In accordance with the provisions of Order No. 2308, dated March 12, 1917, which reads in part as follows:

* * * * *

> Obvious informalities in the application may be corrected by the examiner, but said correction must be in the form of an amendment, approved by the Principal Examiner in writing, placed in the file, and made a part of the record. The changes specified in the amendment will be entered by the clerk in the regular way.

* * * * *

the changes, hereinafter specified, are made by the examiner in the application above identified.

Should these changes not be satisfactory to the applicant, appropriate amendment may be proposed under the provisions of Rule 78, provided the specification has not been printed.

The application has been amended as follows:

Claim 28, (original claim 27), line 2, —*having*— has been inserted after "portion" and —*and*— after "faces" has been canceled.

K

W. C. GLEICHMAN,
Acting Examiner.

H.W.F.G. 204661—151

(Mail Room Aug 3 1931 U. S. Patent Office)

54 55

B original patent

EVANS & McCOY
PATENT LAWYERS
Bulkley Building
Cleveland

Lloyd L. Evans
William C. McCoy
Arnold C. Rood
Frank S. Greene

Telephone
Main 0470

August 1, 1931.

Donald B. Waite

Hon. Commissioner of Patents,
Washington, D. C.

Re: *Gulick Patent No. 1,815,733*

Sir:

It is noted that the word "separating" in line 9 of claim 30 of the above designated patent is incorrect, and should read "and separated." P. E.

This claim originated as Count 1 of Interference No. 49,571 wherein the correct wording of the claim appears.

Correction is requested because the language of the claim is incorrect as it now stands in the printed patent.

The original patent is enclosed.

Recommended R. F. W.

Respectfully submitted,
Evans & McCoy.

WCM-FW
Encl.

(Approved Aug 25 1931 T. E. Robertson Commissioner of Patents)

204661—152

ABS

55 56

Address only Letter No. 113455
The Commissioner of Patents
Washington, D. C.

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
Washington, August 19, 1931.

In the matter of
Letters Patent No. 1,815,733,
Edward J. Gulick, Assor.,
July 21, 1931,
Evans and McCoy, attorneys.

Report of the Chief of the Issue and Gazette Division.

Attorneys return Letters Patent requesting that a certificate be issued correcting the following error:

Line 9 of Claim 30, the word "separating" should read "and separatinged"

Examination of the record discloses that the error is chargeable to the Printer.

Respectfully,

J. H. Luthy,
Actg *Chief of the Issue Division.*

To Commissioner of Patents.

204661—153

ABS

Address only Letter No. 57
The Commissioner of Patents
Washington, D. C.

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
Washington, September 24, 1931.

Messrs. Evans and McCoy,
Bulkley Building,
Cleveland, Ohio.

Gentlemen:—

Herewith, find Letters Patent No. 1,815,733, with the Certificate of Correction endorsed thereon, in accordance with your request.

Sincerely yours,

J. A. BREARLEY,
J. A. BREARLEY,
Chief Clerk.
Div. B.

Inclosure.

204661—154

NOTICE ON FILING OF PATENT CASE

(Mail Room Dec 16 1931 U. S. Patent Office)

DISTRICT COURT OF THE UNITED STATES
NORTHERN DISTRICT OF OHIO
EASTERN DIVISION

Honorable Commissioner of Patents, Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (~~41~~ 42 Stat. L.....), you are advised that there was filed on the 15th day of December, 1931, in this court an action, suit, or proceeding, No. 4106 Equity, entitled—

Name The Cleveland Trust Company, Plaintiff
Address Cleveland, Ohio

EE²

versus

Name The Lawrence-Ohio Company, Defendant
Address Cleveland, Ohio

brought upon the following patents:

PATENT NO.	DATE OF PATENT	PATENTEE
1,402,309	January 3, 1922	The Cleveland Trust Co.
1,763,523	June 10, 1930	The Cleveland Trust Co.
1,815,733	July 21, 1931	The Cleveland Trust Co.

In the above-entitled case, on the ..... day of ....., 193 , the following patents have been included by .....

(Insert amendment, answer, cross bill or other pleading)

PATENT NO.	DATE OF PATENT	PATENTEE

In the above-entitled case the following decision has been rendered or decree issued:

IN WITNESS WHEREOF, I have affixed my hand this 15th day of December, 1931, at Cleveland, Ohio.

B. C. Mullan, *Clerk.*
F. J. Denzler,
By O. M. NELSON,
Deputy Clerk.

204661—155

(Mail Room Jun 11 1932 U. S. Patent Office)

NOTICE ON FILING OF PATENT CASE

DISTRICT COURT OF THE UNITED STATES
NORTHERN DISTRICT OF OHIO
EASTERN DIVISION

Honorable Commissioner of Patents, Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (41 42 Stat. L....), you are advised that there was filed on the 15th day of December, 1931, in this court an action, suit, or proceeding, No. 4106, entitled—

Name The Cleveland Trust Company, Plaintiff
Address Cleveland, Ohio

versus

Name The Lawrence-Ohio Company, Defendant
Address Cleveland, Ohio

brought upon the following patents:

Patent No.	Date of Patent	Patentee
1,402,309	January 3, 1922	The Cleveland Trust Co.
1,763,523	June 10, 1930	The Cleveland Trust Co.
1,815,733	July 21, 1931	The Cleveland Trust Co.

In the above-entitled case, on the ..... day of ....., 193.., the following patents have been included by .....
(Insert amendment, answer, cross bill, or other pleading)

Patent No.	Date of Patent	Patentee

In the above-entitled case the following decision has been rendered or decree issued:

June 10, 1932. Interlocutory Default Decree filed & ent. U. S. Letters Patent No. 1,815,733 good & valid in law as to claims 1, 15, 22, 25, to 30 incl. 41, 42, & 43: No. 1,763,523 good & valid in law as to claims ~~2, 4;~~ 1; No. 1,402,309 good & valid in law as to claims, 3, 4, 8, & 11; Pltf. is owner of each of the above Letters Patent; deft. has infringed each of the claims thereof; pltf. to recover of deft.; cause referred to C. D. Friebolin to determine amt. of damages sustained; injunction granted; costs vs. deft. West J.

In Witness Whereof, I have affixed my hand this 10th day of June, 1932, at Cleveland, Ohio.

~~B. C. Mullen~~
F. J. Denzler, *Clerk.*
By .....
Deputy Clerk.

204661—156

(Mail Room Sep 22 1932 U. S. Patent Office)

DISTRICT COURT OF THE UNITED STATES

EASTERN DISTRICT OF MICHIGAN

HONORABLE COMMISSIONER OF PATENTS,
WASHINGTON, D. C.

SIR:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 19th day of September, 1932, in this court an action, suit, or proceeding No. 5564, entitled:

Name The Cleveland Trust Company, Plaintiff,
Address Cleveland, Ohio

versus

Name Ray Day Piston Corporation of Detroit,
Defendant,
Address Detroit, Michigan

brought upon the following patents:

	PATENT NO.	DATE OF PATENT	PATENTEE
1	1,402,309	Jan. 3d, 1922	Louis P. Mooers
2	1,763,523	June 10, 1930	Frank Jardine
3	1,815,733	July 20, 1931	Edward J. Gulick

In the above-entitled case, on the ..... day of ....., 193.., the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

PATENT NO.	DATE OF PATENT	PATENTEE

In the above-entitled case the following decision has been rendered or decree issued:

.....

IN WITNESS WHEREOF I have affixed my hand this Nineteenth day of September, 1932, at Detroit, Michigan.

ELMER W. VOORHEIS,
Clerk of said Court.

By: ALBERT L. ALHED,
Deputy Clerk.

204661—157

PRINTER'S NOTE:

A copy of U. S. Patent No. 1,815,733, July 21, 1931, to E. J. Gulick was bound into the original of this Exhibit at this point, but as it is incorporated, *supra*, page 1283, as Plaintiffs' Exhibit No. 2, it has been omitted to comply with the Equity Rule against duplication.

2-421

1917

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1. Application 1 papers.
2. **Rej.** Apr 2-1918
3. **Rej Sept. 16, 1918**
4. Amendment **A July 26, 1919**
5. **Rej** Nov 15 1919
6. Amendment **B Sep. 24, 1920**
7. **Rej.** Nov 19 1920
8. Amendment **C Oct. 29, 1921**
9. Amendment **D and Affidavit Dec. 23, 1921**
10. **Rej** Jan 30 1922
11. Amendment **E Sept. 11, 1922**
12. Oct 6-1922
13. Amendment **(~~not ent~~) F and Sup. Oath Mar. 19/23**
14. **Sug Claims** Apr 5-1923
15. Amendment **G—April 16, 1923.**
16. **Intf Brief "~~A~~" (1)**
17. **Intf. Letter, "~~A~~" (1)** Jul 7 1923
18. **Intf. Brief "~~B~~" (2)**
19. **Intf Letter "~~B~~" (2)** Jul 7 1923
20. **Intf Brief "~~C~~" (3)**
21. **Intf Letter "~~C~~" (3)** Jul 7 1923
22. **Intf Brief "~~D~~" (4)**
23. **Intf Letter "~~D~~" (4)** Jul 7 1923.
24. **Intf Brief "~~E~~" (5)**
25. **Intf Letter "E" (5)** Jul 7 1923
26. **Intf Brief "~~F~~" (6)**
27. **Intf Letter "~~F~~" (6)** Jul 7 1923
28. **Intf Brief "~~G~~" (7)**
29. **Intf Letter "~~G~~" (7)** Jul 7 1923
30. **Intf Brief "~~H~~" (8)**
31. **Intf Letter "~~H~~" (8)** Jul 7 1923
32. **Intf Brief "~~I~~" (9)**
33. **Intf Letter "~~I~~" (9)** Jul 7 1923

34. Intf Brief "L"
35. Intf Letter "L" (10) Jul 7 1923
36. Intf Brief "S" (11)
37. Intf Letter "S" Jul 7 1923
38. Intf Brief "T"
39. Intf Letter "T" Jul 7 1923
40. Asso Power of Atty June 29/23
41. Party Added (8) 1923
42. Party Added (4) Dec 1923
43. Rev. and Power of Atty by Assignee Mar. 3/24
44. Notices of Revocation and Acceptance Mar. 11
45. Power to inspect, Dec, 11. 192
46. Withdrawal of Power of Attorney July 20/2
47. Power of Atty by Assignee Aug. 3/
48. Permit to inspect Sept
49. Letter to Office (Drfts) Apr
50. Amendment H Apr 4
51. Final Rejection 1661 Apr
52. Amendment I Apr 30 1931
53. Oath May 15 1931
54. Exr's Amendment Jul 8 1931
55. Request for C of C. Aug 1/31
56. Report by D in B. Aug 19/31
57. Pat. returned with C of C
58. Notice of Suit Dec. 16-1931
59. Notice of Suit June 11-1932
60. Notice of Suit Sept. 22-1932
61.

DEFENDANTS' EXHIBIT 4-L_1.

File Wrapper and Contents of Mooers Patent in Suit.

(Filed January 27, 1934.)

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DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of the File Wrapper and Contents, in the matter of the Letters Patent of Louis P. Mooers, Assignor by Direct and Mesne Assignments to The Cleveland Trust Company, Number 1,402,309, Granted January 3, 1922, for Improvement in Pistons for Internal Combustion Motors.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this 1st day of June, in the year of our Lord, one thousand nine hundred and twenty-three and of the Independence of the United States of America the one hundred and forty-seventh.

WM. A. KINNAN,

(Seal) *Acting Commissioner of Patents.*

2—437

NUMBER (SERIES OF 1915),
172380 1917
DIV. 12 PATENT No. 1402309 (EX'R's BOOK.) 41-2 B

Name Louis P. Mooers, Jan 3 1922
Assor ~~of 1/2 to George B. Pitts, of Cleveland, Ohio.~~ by direct and mesne assigts. to The Cleveland Trust Company, of Cleveland, Ohio, a corp. of Ohio.

of Cincinnati
County of
State of Ohio.

Invention Piston for Internal Combustion Motor ~~and Process of Making the same.~~ Per C

PARTS OF APPLICATION FILED.

	Original.	Renewed.
Petition	June 2, 1917	, 191
Affidavit	" " 1917	, 191
Specification	" " 1917	, 191
Drawing 3 Shts	" " 1917	, 191
Photo Copy (Sheet 3)	Mar. 25, 1921	, 191
First Fee Cash $15	June 2, 1917	, 191
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Examined and Passed for Issue	June 3, 1921	, ~~19~~
P. P. Pierce	Exr. Div. 12	Exr. Div. , ~~19~~
Notice of Allowance Jun 3-1921	, 191	, 191
	By Commissioner.	By Commissioner.
Final Fee Cash $20	Dec. 2, 1921	, 191
" " Cert.	, 191	, 191
Patented	Jan 3 1922	, 191

Attorney Hayner H. Gordon,
Ouray Bldg. City
2
Associate Attorney
3

(No. of Claims Allowed 9) Title as Allowed Piston for Internal Combustion Motor—Print Claim 1 in O. G. (Cl. 74-108)

Division of App., No. ....., filed ....., 191..

2B

$15—Rec'd Jun 2 1917 G
C. C. U. S. Pat. Office

Division 12, **Paper No. 1**
Jun 5 1917
U. S. Patent Office

PETITION.

To the Commissioner of Patents:

Your petitioner, Louis P. Mooers, a citizen of the United States, residing at Cincinnati in the County of Hamilton, and State of Ohio, whose Post Office address is care of The Ahrens-Fox Fire Engine Co., Cincinnati, Ohio, prays that Letters Patent may be granted to him for improvements in Piston for Internal Combustion Motor ~~and Process of Making the Same~~ as set forth in the annexed specification.

Per C

And he hereby appoints ~~Edward R. Alexander, of~~ **Hayner H. Gordon, Ouray Building,** Washington, D. C., ~~Reg. No. 6273~~ **Reg. No. 10,822,** as his Attorney, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

LOUIS P. MOOERS.

SPECIFICATION

To All Whom It May Concern:

Be it known that I, Louis P. Mooers, a citizen of the United States, residing at Cincinnati, in the County of Hamilton, and State of Ohio, have invented certain new and useful improvements in and relating to Pis-
Per C ton for Internal Combustion Motor ~~and Process of Making the Same,~~ of which the following is a specification.

3B

Sub. D[1] This invention relates to pistons for use particularly in internal combustion motors and process of making the same.

One of the objects of my invention is to produce a simple, light, durable and efficient skirted piston peculiarly adapted to meet the conditions which exist in an internal combustion motor cylinder, including the stresses and strains imposed upon the piston, principally during the explosion stroke, and by the high heat generated at this time, which heat must be efficiently and economically (a) utilized in the translation of heat into mechanical energy, and (b) that not translated into mechanical energy properly dissipated.

My present invention comprises improvements on the joint invention of myself and Edward O. Spillman disclosed in Letters Patent of the United States No. 1,092,870.

It contemplates simplifying the construction and manufacture of pistons of this patented type and of considerably lightening the construction as compared with the integral cast structure illustrated in the said patent. It further contemplates the disposition of the parts which go to make up the piston relative to each other so that pistons embodying one form of this invention may be made readily in permanent molds.

It further contemplates the idea of dissipating the heat from the head of the piston more effectively, as

—1— 4B

concerns the wrist pin bosses, than is the case with the construction illustrated in the said patent No. 1,092,870.

Other objects of my invention will be obvious to one skilled in the art from the description of one or more embodiments of my idea which I have herein selected to make for the purpose of a comprehensive disclosure of my improvements to one skilled in the art.

In the drawings, Fig. 1 is a longitudinal section of a piston embodying my improvements taken through the axis of the wrist pin bosses.

Fig. 2 is a section on the line 2-2, Fig. 1.

Fig. 3 is a bottom plan view looking into one of my improved pistons.

Fig. 4 is a section on the line 4-4, Fig. 1.

Fig. 5 is a longitudinal section taken through the axis of the wrist pin bosses of a modified form of piston embodying my invention.

Fig. 6 is a section on the line 6-6, Fig. 7.

Fig. 7 is a bottom plan view of the construction of piston illustrated in Fig. 5.

Fig. 8 is a side elevation of a piston casting after being taken from the mold and before any machining is done on it.

Fig. 9 is a side elevation of said piston casting after it has been externally machined and the cut made to provide the air gap between the head and the skirt section of the piston.

—2— 5B

Fig. 10 is a longitudinal section through the axis of the wrist pin bosses of another modified form of my invention.

Fig. 11 is a section on the line 11-11, Fig. 12.

Fig. 12 is a bottom plan view of the piston construction illustrated in Fig. 10.

per A Fig. 13 is a section on the line 13-13, Fig. ~~12~~ 11.

Fig. 14 is a section on the line 14-14, Fig. 10.

—3— 6B

In Figs. 1 to 4 inclusive, 1 is the skirt, body or guide portion of the piston. 2 is the top or piston head. 3 are columns or connectors, preferably integrally formed with the skirt 1 and head 2 for connecting these two parts

of the piston together. The head preferably has an end wall 2' and an outer peripheral wall 2a, the latter formed preferably with suitable piston ring grooves 2b.

Intermediate its ends the guide portion or skirt 1 is preferably formed with inwardly extending, diametrically opposed, aligned, annular wrist pin bosses 1a, 1b, one of which may have a downwardly or laterally extending lug 1c formed with a screw-threaded hole to receive in the well known manner a suitable locking bolt or screw for the wrist pin (not shown).

The upper end of the guide section or skirt is separated from the head 2 by an air gap. In the drawings, purely for the purpose of illustration, this air gap is shown wider than is necessary. The presence of this air gap or air space between the upper edge of the skirt or body section 1 and the lower edge of the peripheral portion 2a of the piston head, insures that the heat absorbed by the piston head principally will be transmitted inwardly and downwardly through the columns 3 so that such portion of it as does reach the skirt or body per C by conveduction will do so at points below said air gap and will be reduced in amount so as to

reduce relatively the expansion of the skirt as compared with the head, thereby permitting the skirt to be fitted relatively closely to the inner walls of the cylinder. While this air gap, as above indicated, has been shown, for the purpose of illustration, wider than necessary, it will be understood that my invention contemplates any sort of a separated relationship between the upper end of the skirt and the adjacent head 2 because of which heat will not be transmitted efficiently or readily per E from the head to the skirt other than through a connector or connectors which join those two parts of the piston together. It will be understood that this relationship might be that of a poor mechanical fit or joint which would be a poor conductor of heat, as compared with the metal of the head 2 and connectors 3, so that such heat as did pass from the head 2 to the skirt 1 would do so principally by way of the connectors 3, rather than from the head to the upper end of the skirt 1 directly.

A piston of my improved construction may be made unusually light, durable and efficient by forming it of an integral casting of a metallic alloy having a relatively

low specific gravity, such for example as an alloy of aluminum, copper and magnesium, or any other
per C metallic alloy of aluminum **or other low specific gravity metal** known by those skilled in the art to be suitable for the construction of cast, skirted pistons. As the alloys of metals of relatively low specific gravity, suitable for such purposes, have relatively high coef-

—5— 8B

ficients of expansion, some difficulty has been
per D experienced with the use of pistons made ~~by~~ of them in internal combustion motors, due to the necessary clearance between the piston walls and the cylinder walls to allow for such expansion; as the result of which clearance, both "piston slapping" and "oil pumping" are likely to result, as is well known to those skilled in the art. Furthermore, liquid hydro-carbons are likely to escape past the piston into the crank case and thin down the lubricant below to an undesirable degree.

It will be understood that with a piston constructed in accordance with my invention, the sleeve or skirt 1 may be constructed so as relatively snugly to fit the inner walls of the motor cylinder, whereas the head 2 may be given a considerable amount of clearance be-
per A tween its outer ~~periphery~~ **surface** and the inner wall of the cylinder to allow for all necessary expansion of the head due to the high temperatures to which it is directly subjected. The fit between the skirt and the inner wall of the cylinder may be a snug sliding fit and the area of the skirt which co-acts with the inner wall of the cylinder be such as to insure against slapping or rapping of the piston against the inner wall of the cylinder. In fact objectionable piston slap, incident to the operation of numerous types of pistons, for use in internal combustion motors, substantially is eliminated, by the use of a piston constructed in accordance with my invention. Likewise oil pumping is substantially eliminated and the passage of liquid hydro-carbons from the top of the piston to the crank case is practically eliminated, resulting in minimizing of undue and trouble-

—6— 9B

some carbonization and undesirable smoking, among other things.

Due to the fact that the skirt or sleeve 1 is maintained relatively cool under all normal conditions, the

possibilities of scoring of the inner walls of the cylinder are practically eliminated.

The construction of a piston embodying my improvements, as hereinbefore described, may be readily carried out in permanent molds, which is not true of the construction illustrated in said Letters Patent No. 1,092,870, and I have had in mind the use of such permanent molds in the design of my said improvements.

The exterior walls of the skirt near the upper end thereof, where the connectors 3 join the skirt, may be relieved or recessed, as indicated at 1d, to allow for greater expansion at these points than will occur at other points in the same circumference of the skirt.

In the modification of my invention, illustrated in Figs. 5 to 7, inclusive, the lower piston ring groove is formed by the walls of a recess in the peripheral flange 2a of the piston head 2 and the upper end wall of the skirt 1. In this case the lower piston ring 5 may be used as and will operate as an oil wiper and will permit the oil to pass underneath it through the grooves 1e in the upper end wall of the skirt 1 and back into the crank case, thus assisting in keeping the motor from smoking. Where the piston rings are mounted as illustrated in

Figs. 1 and 2, the air gap between the upper end of the skirt and the adjacent wall of the peripheral flange of the piston head will serve to provide an escape for oil back to the crank case from the cylinder walls and substantially eliminate undesirable smoking of the motor.

In the modified construction illustrated in Figs. 10 to 14, inclusive, all of the columns or connectors 3 are disposed out of alignment with the wrist pin bosses 1a. When thus disposed the amount of heat transmitted through such connectors to the wrist pin bosses will be somewhat reduced over that of a piston having the construction illustrated in Figs. 1 to 4, inclusive, as none of such connectors will transmit heat directly to either of the wrist pin bosses, there being a section of skirt between the connection of the lower end of each such connector with the skirt and the connection of the adjacent wrist pin boss with the skirt. Furthermore, with this last referred to modification the relief spaces or recesses in the outer wall of the piston adjacent the points at which the connectors 3 join the skirt will be so disposed as not to reduce any of the principal wearing surfaces of the piston against the inner wall of the cylinder.

Insert C^1

It will be noted that pistons embodying my improvements may be made relatively light in weight, which is of material advantage in assisting in reducing the weight of the reciprocating parts of the motor.

—8— 11B

Pistons of my improved construction will be found to operate comparatively noiselessly, smoothly and efficiently within the cylinders of internal combustion motors and with greatly reduced skirt clearances over ordinary constructions of skirted pistons.

Insert D^2 ~~In my improved process of making a piston for an internal combustion motor the~~ casting may be formed in any suitable mold as a cup-shaped article, as indicated in Fig. 8. Then the outer surface of such casting may be suitably machined or ground so as to have the general external dimensions illustrated ~~in Fig. 9 and thereafter~~ the head 2, including end wall 2' and peripheral wall 2a may be separated from the skirt 1 by inserting a cutting tool at 7, so as to form the air gap between the lower end wall of the peripheral flange 2a of the head and the upper end wall of the skirt. This separation of the head from the skirt may be effected before externally surfacing the casting, if desired. Any well known type of cutting mechanism may be employed for the purpose. After the cut is made the exterior of the casting will have the general appearance illustrated in Fig. 9.

Sub C^2

To those skilled in the art of making mechanism of the class described, many alterations in construction and widely differing embodiments of my application will suggest themselves without departing from the spirit and scope thereof. My disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

—9— 12B

What I Claim Is:

1. A piston for an internal combustion motor, comprising a skirt section having a pair of diametrically opposed wrist pin bosses integrally formed with the skirt and extending inwardly from the inner wall thereof, a head having end and peripheral walls, the lower edge of the latter being spaced from the upper edge of the skirt section by an air gap, and means extending from said end wall of said head

Sub. C^3

per A across said air gap to **the most closely adjacent portions of** said skirt section and connecting said parts together.

2. A piston for an internal combustion motor, comprising a skirt section having a pair of diametrically opposed wrist pin bosses integrally formed with the skirt and extending inwardly from the inner wall thereof, a head having end and peripheral walls, the lower edge of the latter being spaced from the upper edge of the skirt section by an air gap, and means integrally formed with the end wall of said head and said skirt section
per A and extending across said air gap ~~for~~ **and** connecting **the most closely adjacent portions of** said parts together.

3. A piston for an internal combustion motor, comprising a skirt section having a pair of diametrically opposed wrist pin bosses integrally formed with the skirt and extending inwardly from the inner wall thereof, a head having end and peripheral walls, the lower edge of the latter being spaced from the upper edge of the skirt section by an air gap, and means disposed out of align-

13B

ment with said wrist pin bosses and extending across said air gap for connecting the end wall of said head and skirt section together.

4. A piston for an internal combustion motor, comprising a skirt section having a pair of diametrically opposed wrist pin bosses integrally formed with the skirt and extending inwardly from the inner wall thereof, a head having end and peripheral walls, the lower edge of the latter being spaced from the upper edge of the skirt section by an air gap, and means integrally formed with said end wall and skirt section and extend-
per A ing across said air gap ~~for~~ **and** connecting **the most closely adjacent portions of** said head and skirt section together.

5. A piston for an internal combustion motor, comprising a skirt section having a pair of diametrically opposed wrist pin bosses integrally formed with the skirt and extending inwardly from the inner wall thereof, a head having end and peripheral walls, the lower edge of the latter being spaced from the upper edge of the skirt section by an air gap, and columns between the head and skirt section formed integrally therewith and disposed out of longitudinal alignment with the wrist pin bosses.

6. A piston for an internal combustion motor, comprising a skirt section having a pair of diametrically opposed wrist pin bosses integrally formed with the skirt and extending inwardly from the inner wall thereof, a head having end and peripheral walls, the lower edge of the latter being spaced from the upper edge of the

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skirt section by an air gap, and connectors extending from said peripheral wall downwardly and connecting **it to the inner surface of the inner circumferential wall of** said skirt.

per A

7. A piston for an internal combustion motor, comprising a skirt section having a pair of diametrically opposed wrist pin bosses integrally formed with the skirt and extending inwardly from the inner wall thereof, a head having end and peripheral walls, the lower edge of the latter being spaced from the upper edge of the skirt section by an air gap, and connectors extending from the ~~outer~~ **inner** peripheral walls of said head and connecting said head with **the inner peripheral wall of** said skirt and being integrally formed with said head and skirt.

per A " "

8. A piston for an internal combustion motor, comprising a skirt section having a pair of diametrically opposed wrist pin bosses integrally formed with the skirt and extending inwardly from the inner wall thereof, a head having an inner wall spaced from the adjacent upper edge of the skirt section by a relatively narrow air gap, and connectors connecting said head with **the inner peripheral wall of** said skirt.

per A

9. A piston for an internal combustion motor, comprising a skirt section having a pair of diametrically opposed wrist pin bosses integrally formed with the skirt and extending inwardly from the inner wall thereof, a head having an inner wall spaced from the adjacent upper edge of the skirt section by a relatively narrow air gap, and connectors connecting said head with **the inner peripheral wall of** said skirt and integrally formed with said head and skirt section.

per A

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10. A piston for an internal combustion motor comprising a head, a skirt section, there being an air gap between the upper edge of said skirt and the adjacent wall of said head and a piston ring receiving groove formed by the upper edge of said skirt and a recess in

said head, and means connecting said skirt to said head across said air gap.

11. A piston for an internal combustion motor comprising a head, a skirt section, there being an air gap between the upper edge of said skirt and the adjacent wall of said head and a piston ring receiving groove formed by the upper edge of said skirt and a recess in said head, means connecting said skirt to said head across said air gap, and a piston ring in said groove.

per B 12. A piston for an internal combustion motor comprising a head, a skirt section, there being an air gap between the upper edge of said skirt and the adjacent wall of said head and a piston ring receiving groove formed by the upper edge of said skirt and a recess in said head, means connecting said skirt to said head across said air gap, and a piston ring in said groove, there being an oil groove in the upper edge of said skirt beneath said piston ring.

per A 13. The process of making a piston for an internal combustion motor, which consists in forming a cup-shaped casting having a pair of diametrically opposed bosses extending inwardly from

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the inside wall of its cylindrical section and a plurality of connectors, each connector extending from the inside of the end wall of said casting a distance therefrom and having its lower end connected with said inside wall of said cylindrical section, and then separating the end wall and a portion of said cylindrical section from the remainder of the cylindrical section by cutting through said cylindrical section between the points at which the ends of said connectors are connected with the casting.

14. The process of making a piston for an internal combustion motor, which consists in forming a cup-shaped casting having a pair of diametrically opposed bosses extending inwardly from the inside wall of its cylindrical section and a plurality of connectors, each connector extending from the inside of the end wall of said casting a distance therefrom and having its lower end connected with said inside wall of said cylindrical section at a point out of alignment with said inwardly extending bosses, and then cutting an opening through said cylindrical section above said wrist pin bosses and between the ends of said connectors.

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IN TESTIMONY WHEREOF I affix my signature, in the presence of two witnesses.

LOUIS P. MOOERS.

Witnesses:

STANLEY ZULINSKI,
JOHN M. WALTER.

OATH

STATE OF OHIO
COUNTY OF HAMILTON } ss.

Louis P. Mooers, the above named petitioner, being duly sworn, deposes and says, that he is a citizen of the United States, and resident of Cincinnati, in the County of Hamilton, and State of Ohio; that he verily believes himself to be the original, first and sole inventor of the improvements in Piston for Internal Combustion Motor and Process of Making the Same described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvements has been filed by him or his representatives or assigns in any country foreign to the United States.

LOUIS P. MOOERS.

Sworn to, subscribed and acknowledged, before me this 31 day of May, 1917.

G. M. MASLER,
Notary Public.

(Seal)

18B

Mail Room
Jun 2 1917
U. S. Patent Office

Division 12, Paper No. 2
Jun 5 1917
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

Application of
Louis P. Mooers
"Piston for Internal Combustion Motor and Process of Making the Same.
Filed June 2, 1917

Hon. Commissioner of Patents:

Sir:

The attention of the Examiner to whom this application which is herewith submitted, is assigned, is respectfully called to the fact that this application contains subject matter which interferes with an application filed by Edward O. Spillman now pending in the Office, and an interference is accordingly requested.

Respectfully Submitted,

LOUIS P. MOOERS,
by HAYNER H. GORDON,
his attorney.

June 2, 1917

19B

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington July 20, 1917.
Mailed " " "

Hayner H. Gordon,
Ouray Bld'g.,
Washington, D. C.

Please find below a communication from the Examiner in charge of the application of L. P. Mooers, S. N. 172,380, filed June 2, 1917, for Piston for Internal Combustion Motor and Process of Making the same.

~~THOMAS E. ROBERTSON,~~
Thomas Ewing,
Commissioner of Patents.

This case has been examined.

Page 3, line 7, "Fig. 12" should be —*Fig. 11*—.

Page 6, line 15, change "periphery" to —*surface*—.

Claims 3 and 5 are specific to the modification shown in Figs. 10 to 14, inclusive, whereas claims 10, 11 and 12 are specific to Figs, 5, 6 and 7.

Election of species is required.

Claims 1, 2, 4, 6, 7, 8 and 9 are rejected on the French patent to

Chenard, *et al.*, 468,595, Apr. 28, 1914, 121-104.

Claims 13 and 14 are improper process claims.

They merely define a structure clearly met by the French patent above cited.

The patents to

Franquist, 1,153,902, Sept. 21, 1915, 74-85; and

Spillman, 1,229,540, June 12, 1917, " " ;

are made of record.

A. B. Reavis,

Act'g. Exr. Div. 12.

N 20B

Application Div. A Division 12, Paper No. 4
U. S. Patent Office U. S. Patent Office
Jul 10 1918 Jul 13 1918 A

U. S. Patent Office U. S. Patent Office
Jul 12 1918 Jul 11 1918
Division XVIII Division XXVIII.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In the matter of the application of Louis P. Mooers, Ser. No. 172,380, filed June 2, 1917, for Piston for Internal Combustion Motor and Process of Making the Same.

Replying to Office Action dated July 20, 1917:

Page 3, line 7, change the character "12" to —*11*—.

Page 6, line 15, change the word "periphery" to —*surface*—.

Claim 1, next to the last line, after the word "to" insert the words —*the most closely adjacent portions of*—.

Claim 2, next to the last line, cancel the word "for" and insert the word —*and*—; same line, after the word "connecting" insert the words —*the most closely adjacent portions of*—.

Claim 4, last line, cancel the word "for" and insert the word —*and*—; same line, after the word "connecting" insert the words —*the most closely adjacent portions of*—.

Claim 6, last line, after the word "connecting" insert the words —*it to the inner surface of the inner circumferential wall of*—.

Claim 7, line 7, change the word "outer" to —*inner*—; line 8, change the word "walls" to —*wall*—; same line, after the word "with" insert the words —*the inner peripheral wall of*—.

—1— 21B

Claim 8, last line, after the word "with" insert the words —*the inner peripheral wall of*—.

Claim 9, next to the last line, after the word "with" insert the words —*the inner peripheral wall of*—.

Cancel claims 13 and 14.

A reconsideration of the claims as amended is respectfully requested. The importance of what may appear to be relatively slight differences in piston construction is now fully recognized by the most advanced thermodynamics. In fact, some of the principal efficiencies recently attained in the operation of internal combustion engines have been largely due to piston construction.

The Chenard, et al. patent of reference discloses a construction in which the webs d are connected to the inner ends of the wrist pin bosses and not to the inner peripheral wall of the skirt. The disadvantage of the French patented construction lies in that substantially all of the heat from the head which is conducted by means of the webs d will be delivered to the wrist pin bosses, and not evenly distributed at that. This is an objection which applicant's construction avoids and was intended to avoid. Again, the core material and construction required in order to produce the Chenard et al. piston is distinctly more complicated than that required to produce applicant's. The amendments to the claims patentably distinguish the subject-matter.

With reference to claims 3 and 5, attention is directed to the fact that they are the only species of connector location claimed. Division should not be requested under these circumstances.

—2— 22B

Claims 10, 11 and 12, on the other hand, relate to a species of piston ring groove construction and not to

connectors. They are the only species presented relative to any piston ring groove construction. The connector construction is applicable to either ring groove construction. It is believed that all of the claims as presented are properly presented in one application. A reconsideration on this point is respectfully asked.

It is not understood that the specification of the French patent discloses the process called for in claims 13 and 14. As such subject-matter is undoubtedly divisional, the claims have been cancelled, the rights of the applicant being reserved.

The specification was originally drawn with the Franquist and Spillman patented constructions in mind and the claims are believed to be clearly differentiated patentably therefrom.

Respectfully submitted,

LOUIS P. MOOERS,

By HAYNER H. GORDON,

Attorney.

Cleveland, Ohio.
July 8 10, 1918.

22—23

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington Sept. 28, 1918.
Mailed " " "

Hayner H. Gordon,
Ouray Bldg.,
Washington, D. C.

Please find below a communication from the Examiner in charge of the application of Louis P. Mooers—for Piston for Internal Combustion Motor and Process of Making the Same—Filed June 2, 1917—Serial No. 172330.

~~THOMAS E. ROBERTSON,~~
James T. Newton,
Commissioner of Patents.

This case has been considered in view of the amendment of July 10, 1918.

Claims 1, 2, 4, 6, 7, 8, 9, 10 and 11 are rejected on patent to Riedler 1,259,292 Mar. 12, 1918 (X74-85)

Claim 12 is rejected on patent to Riedler, supra in view of oil groove shown in patent to Franquist of record or to

Rohn 1,232,846 July 10, 1917 (X74-85)

According to the decision in Ex parte Welch 93 O. G. 2104 all claims should be readable on a single modification.

To conform to this ruling the drawings on sheet 2 should be corrected so that the columns "3" of Figure 5 to 9 would be shifted so as to be out of alignment with the pin bosses such as shown in Figures 10 to 14.

After this correction is made all the claims will be readable on Figures 5 to 9.

A. B. REAVIS,
Act'g. Exr. Div. 12.

B.V.Z.

23B

Mail Room
Sep 26 1919
U. S. Patent Office

Division 12, **Paper No. 6**
Sep 26 1919
U. S. Patent Office.

U. S. Patent Office,
Sep 27 1919
Division XXVIII.

B
and
Affidavit

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In the matter of the application of Louis B. Mooers, for Piston for Internal Combustion Motor and Process of Making Same, filed June 2, 1917, Ser. No. 172,380:

B

Replying to Office action of September 28, 1918:

The patent to Riedler has been carefully considered. It is submitted that the construction therein shown is not comprehensive of the subject-matter of the claims. As we interpret the Riedler construction it is merely a trunk piston with two holes e through it. The lower edge of the head is not spaced from the upper edge of the skirt by an air gap in the sense specified in the rejected claim. The side elevations of the walls of the aperture indicated that

the skirt is indented and not that there is a distinct air gap between the upper edge of the skirt and the lower end of the head section with means extending from the *end wall* or head for connecting the head to the skirt and conducting heat from the head across the air gap to the skirt. However, applicant's invention was made prior to the filing date of the Riedler application in the United States. Riedler does not claim applicant's invention and if Riedler has a corresponding German patent, it cannot be taken advantage of in the present instance to carry back Riedler's date with respect to subject-matter not claimed by him.

—1— 24B

Applicant files herewith an affidavit under Rule 75 carrying his date of invention back of the filing date of the Riedler patent and respectfully requests the reconsideration of claims 1, 2, 4, 6, 7, 8, 9, 10 and 11.

Cancel claim 12.

As to the requirement for correction to Figures 5 to 9 of the drawings, it is respectfully requested that this objection be not insisted upon at the present stage of the prosecution, but only after the scope of allowable claims is conclusively established.

Respectfully submitted,

LOUIS P. MOOERS,
By HAYNER H. GORDON,
Attorney.

Washington, D. C.
September 26, 1919.

—2— 25B

Louis P. Mooers,
Piston for Internal Combustion Motor and Process of Making the Same,
Filed June 2, 1917,
Ser. No. 172,380.

OATH

STATE OF OHIO }
COUNTY OF CUYAHOGA } ss.

LOUIS P. MOOERS, being duly sworn, deposes and says that he is the Louis P. Mooers who filed the above entitled application relating to Piston for Internal Combustion Motor; that he is a citizen of the United States and resident of Cincinnati in the County of Hamilton and

State of Ohio; that he verily believes himself to be the original, first and sole inventor of the improvement in Piston for Internal Combustion Motor shown and described in the above entitled application;

That the subject-matter set forth in claims 1, 2, 4, 6, 7, 8, 9, 10 and 11 was a part of his invention and was invented by him prior to the 31st day of January, 1917; that prior to the 31st day of January, 1917, he fully disclosed his said invention to E. E. Allyne, of Cleveland, Ohio, and others; that prior to January 31st, 1917, at the request of the said E. E. Allyne, he made full-sized working drawings of the said invention and sent the same from Cincinnati, Ohio, to the said E. E. Allyne at Cleveland, Ohio; that the photostat copy hereto attached, made a part hereof and marked "Exhibit A," is a photograph of the said drawings; that owing to conditions entirely beyond affiant's control, namely, those existing during

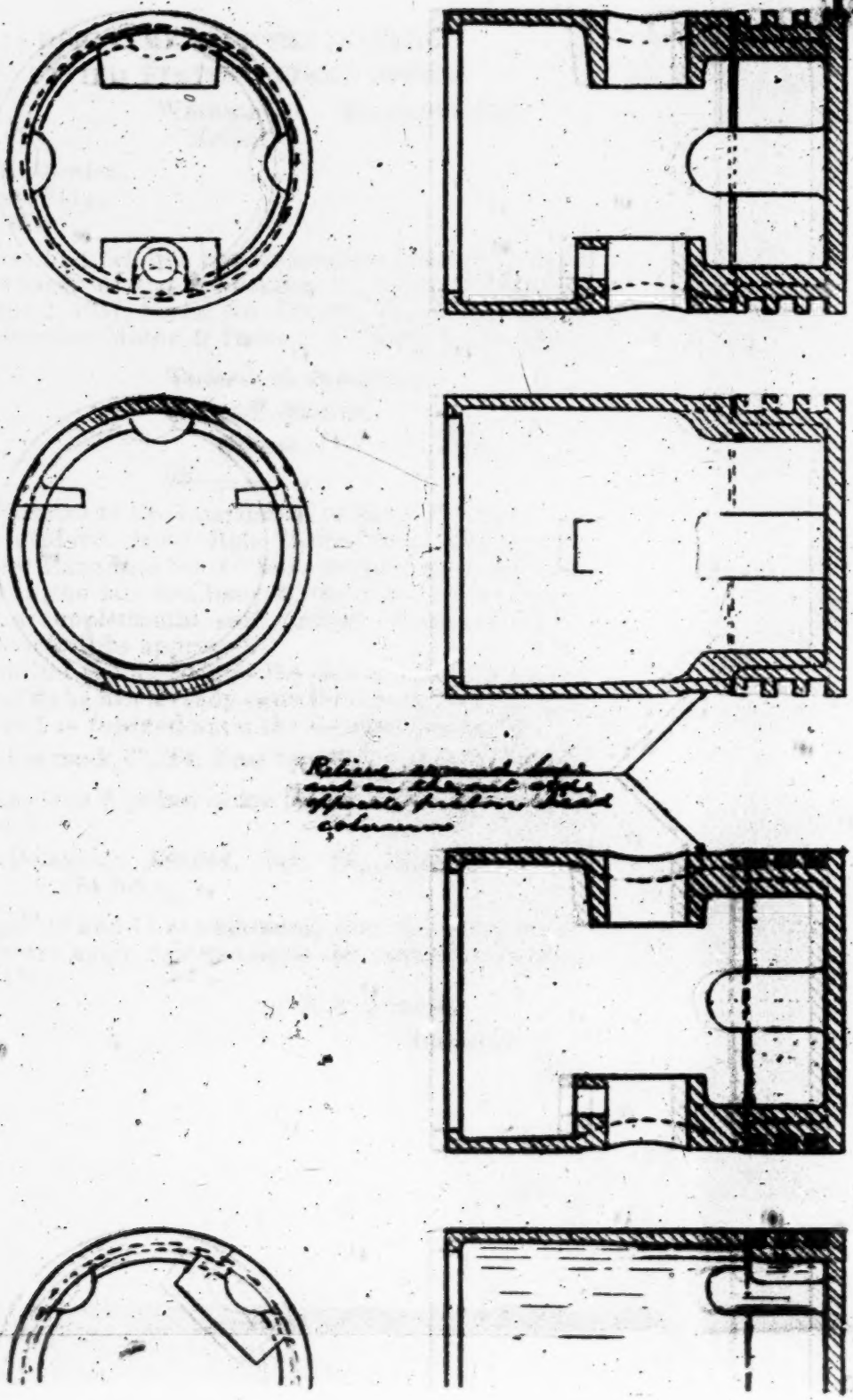
and imposed by the war, affiant was unable to produce pistons embodying his idea, it being essential that they should be made out of aluminum and the plant in which the said E. E. Allyne was interested, where such pistons could be made, being wholly engaged in war work; that applicant made the invention at the request of the said E. E. Allyne for a piston which could be made of aluminum in a so-called permanent mold and that the said E. E. Allyne was president of the only Company in this country, within applicant's knowledge, where such molds were made; that with all reasonable dispatch after the armistice the said E. E. Allyne had pistons embodying applicant's said invention made and successfully tested at Cleveland, Ohio, and that affiant took all reasonable steps, under existing circumstances, to demonstrate the practicability of his idea and to reduce the same to practice; that the war conditions with which he had to contend prior to June 2, 1917, the date of the filing of his application, were such as to preclude earlier reduction to practice of his invention.

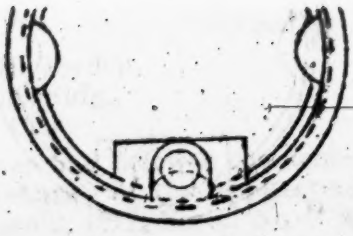
LOUIS P. MOOERS.

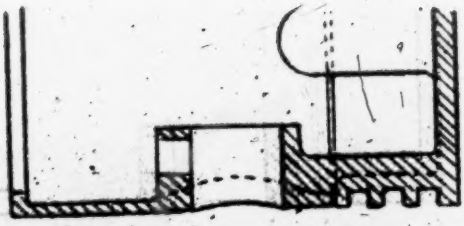
Sworn to and subscribed before me, a Notary Public, at Cleveland, County of Cuyahoga and State of Ohio, this 15th day of September, 1919.

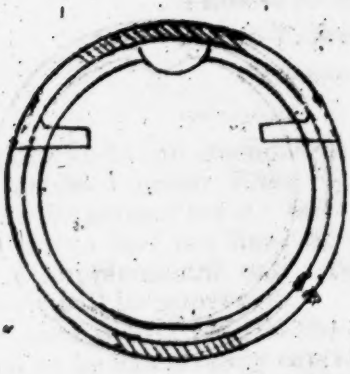
L. S. LOMMASSON,
(Notarial Seal) *Notary Public.*

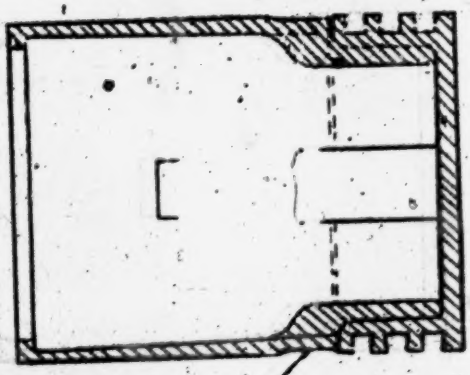
1997


Ribbing around base and on shaft of the Ionic Building Head columns









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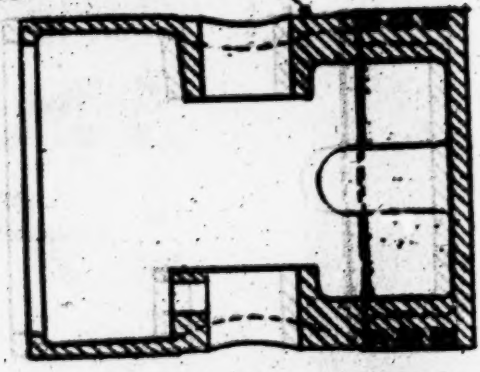
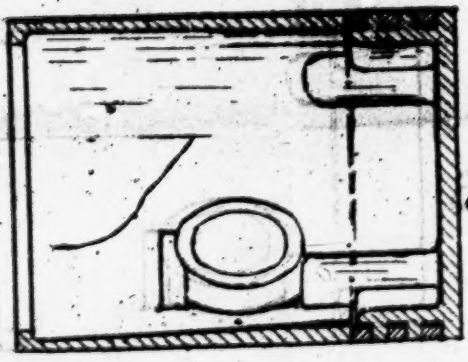




Ex D

288

Z/D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington January 6, 1920.
Mailed " " "

Hayner H. Gordon,
Ouray Bldg.,
City.

Please find below a communication from the EXAMINER in charge of the application of Louis P. Mooers, Filed June 2, 1917, Serial No. 172,380, Piston For Internal Combustion Motor & Process of Making the Same.

~~THOMAS E. ROBERTSON,~~
James T. Newton
Commissioner of Patents.

Responsive to the amendment of Sept. 26, 1919.

The affidavit under Rule 75 has been disapproved by the Law Examiner for it "fails to make the averments specified in the last ten lines of the rule. If applicant will file a supplemental oath making these averments the affidavit will be approved."

Applicant should restrict the title of his invention to the article as he has already cancelled the process claims.

Claim 1 is rejected upon the German patent to

Czermak, 67,264, June 14, 1892 (1 sheet) (74-108)

Claims 2 to 9 inclusive are rejected upon the French patent to

Delaunay, 480,644, Jan. 10, 1916 (2 sheets) (74-108)

Claims 10 and 11 are allowable over the above references but are again rejected upon the patent to Riedler, of record.

P. P. PIERCE,
Examiner.

B. V. Z.

29B

Mail Room
Jan 4 1921
U. S. Patent Office

Division 12, **Paper No. 8**
Jan 6 1921
U. S. Patent Office

C &
Affidavit

ent
Cls

IN THE UNITED STATES PATENT OFFICE

In re application of
Louis P. Mooers,
PISTON FOR INTERNAL COMBUSTION MOTOR AND PROCESS OF MAKING SAME
Serial No. 172,380,
Filed June 2, 1917.

Division 12
Room 322.

Hon. Commissioner of Patents,

Sir:

C In response to the Office action of January 6, 1920, applicant amends as follows:

In the petition and in the preamble to the specification, amend the title of the invention by striking out the words "and Process of Making the Same."

Page 4, next to last line, change "convection" to —*conduction*—.

Page 5, line 4 from the bottom, after "aluminum" insert —*or other low specific gravity metal*—.

Page 8, after the paragraph ending in line 5 from the bottom, insert the following:

—In addition, with all the connectors 3 disposed in the regions of the pin bosses, as disclosed in Figs. 10 to 14, inclusive, the piston is especially well adapted to run with a close fit of the guide section 1 in the

C^1 cylinder. It will be observed, on reference to Figs. 10, 13 and 14, that said guide section has a circumferential zone or belt extending from its upper end down to and below the pin boss openings that is characterized by a short outer diameter in line with the bosses and a long

outer diameter at right angles to said bosses, this being due to the above described relief of the piston adjacent the bosses and the connectors 3. Thus when this top

zone of the guide heats up the resulting expansion can be accommodated by outward movement of the relieved part of the wall and danger of seizing, as a result of close engagement between the unrelieved part of said wall and the cylinder, is obviated. This action, of course, is made possible by the fact that the upper end of the guide section is not continuously joined to the head section but, being separated from the head by the air gap, is free to take form in a measure independent of the head. The bottom part of the guide section does not attain so high a temperature as said upper zone so that no special provision for the expansion of said lower part is required.—

Page 9, in lines 9, 10 and 11, strike out "Then the outer surface of such casting may be suitably machined or ground so as to have the general external dimensions illustrated in Fig. 9 and thereafter" and insert in lieu thereof the following:

—While the invention is not limited to any particular method of casting it is to be observed that the improved construction is especially well adapted for casting in a permanent mold, the form and arrangement of the connectors 3 relative to the inner piston walls and the absence of any obstruction that would prevent free access to said inner walls from the open end of the piston, obviating all difficulties incident to coring. The casting being made, its outer surface may be suitably machined or ground so as to have the general ex-

C²

—2— 31B

ternal form illustrated in Fig. 9, or in Figs. 10, 13 and 14, and thereafter—.

Cancel the present claims, Nos. 1 to 11, inclusive, and insert in lieu thereof the following:

—1. An integrally cast piston comprising a head section having end and peripheral walls, a guide section separated at its upper edge from the lower end of the peripheral wall of said head section by an air gap and provided with diametrically opposite wrist pin bosses, and section connectors which spring from the inner surface of the peripheral wall of the head section across said air gap to the upper part of the guide section in the regions of said wrist pin bosses, ~~the interior surface of the head and~~

C³

per D

Insert D^3 ~~guide sections being freely accessible from the open end of the piston.~~

2. An integrally cast piston comprising a head section having end and peripheral walls, a guide section separated at its upper edge from the lower end of the peripheral wall of said head section by an air gap and provided with diametrically opposite wrist pin bosses, and section connectors which spring from the inner surface of the peripheral wall of the head section across said air gap to the upper part of the guide section in the regions of said wrist pin bosses, the wall of said guide section being exteriorly relieved opposite said connectors. per D

3. A piston comprising a head section having end and peripheral walls, a guide section provided with diametrically opposite wrist pin bosses, and means connect-

ing the head and guide sections in the regions of said bosses, the upper edge of the guide section and the lower edge of the head being separated by an air gap in the regions between said connecting means, and the guide section being exteriorly relieved in the regions of the bosses and connecting means. per D

4. An integrally cast piston comprising a head section having end and peripheral walls, a guide section provided with diametrically opposite wrist pin bosses, and means connecting the head and guide sections in the regions of said bosses, the upper edge of the guide section and the lower edge of the head being separated by an air gap in the regions between said connecting means and the guide section being exteriorly relieved in the regions of the bosses and connecting means.

5. A piston for an internal combustion engine comprising a guide section having a pair of diametrically opposed wrist pin bosses integrally formed therewith, a head having end and peripheral walls the lower edge of the latter being spaced from the upper edge of said guide section by a practically continuous non-conducting air gap, and connectors which extend from said peripheral walls downwardly to said guide section and are integrally formed with said peripheral wall and guide section, said guide section being exteriorly relieved in the regions of said connecting means. per D

6. An integral cast piston for an internal combustion engine comprising a guide section having a pair of diametrically opposed wrist pin bosses, a head section having end and peripheral walls, the lower edge of the latter being separated from the upper edge of said guide section by a relatively narrow air gap extending practically around the piston, and connectors which spring from said peripheral wall of said head and the upper end of said guide section and bridge said air gap, D^4 said guide section being exteriorly relieved in the regions of said connecting means.

Insert D^4

7. An integral cast piston for an internal combustion engine comprising a guide section having a pair of diametrically opposed wrist pin bosses, a head section having end and peripheral walls, the lower edge of the latter being separated from the upper edge of said guide section by a relatively narrow air gap extending practically around the piston, and connectors which spring from said peripheral wall of said head and the upper end of said guide section in the regions of said wrist pin bosses and bridge said air gap, said guide section being exteriorly ~~relieved in ever-continuous areas embracing the regions of said bosses and connecting means.~~

per D
Insert E^1

8. A piston for an internal combustion motor, comprising a ~~skirt~~ **guide** section having a pair of diametrically opposed wrist pin bosses integrally formed with the ~~skirt and extending inwardly from the inner wall thereof,~~ **guide section** a head having end and peripheral walls, the lower edge of the latter being ~~spaced~~ **separated** from the upper edge of the ~~skirt~~ **guide** section by an air gap, and means disposed out of alignment with the axes of said wrist pin

per E
" E
" E
per E
" E
per D

bosses and extending across said air gap and providing the sole means of connection between said head and guide section.

9. A piston for an internal combustion motor, comprising a ~~skirt~~ **guide** section having a pair of diametrically opposed wrist pin bosses integrally formed with the ~~skirt and extending inwardly from the inner wall thereof,~~ **guide section** a head having end and peripheral walls, the lower edge of the latter being ~~spaced~~ sepa-

per E
" E
" E
" E

per E rated from the upper edge of the ~~skirt~~ guide section by an air gap, and ~~columns between the~~ Sub. E^2 ~~head and skirt guide section formed integrally~~ per D ~~therewith disposed out of longitudinal alignment with the axes of the wrist pin bosses~~, and providing the sole means of connection between said head and guide section.—

Insert E^3 Applicant files herewith a supplemental affidavit which is believed to meet the requirements noted in the last Office letter.

The claims have been carefully rewritten in view of the Examiner's citations and the conference had and are believed to now clearly distinguish from the prior art, the marked differences between applicant's piston and those disclosed in the patents cited being, of course, quite obvious. These differences, in the case of the French patent No. 480,644, upon which the Examiner principally relied, are distinctly notable. Applicant's piston is especially adapted to be made of aluminum or other light alloys and to be cast in a permanent mold. In permanent mold work, of course, the problem of coring is of vital importance. Obviously it would be

quite impossible to cast the Delaunay piston in a permanent mold. In applicant's piston the connectors 3 spring from the inner surfaces of the side walls of the head and the guide and the interior surfaces of the piston are freely accessible from the open end of the piston so that the piston can be cast in permanent mold practically as easily as the standard form of trunk piston. These features are believed to be clearly brought out in claim one The Delaunay piston is clearly a piston developed for the function of controlling the flow of gases to the combustion chamber. It is not of the same type or character as applicant's, which as stated in the specification, is an improvement on pistons of the character disclosed in Spillman & Mooers patent No. 1,092,870. The problem has been with the introduction of aluminum alloys to conserve the metal in piston manufacture as much as possible and to produce a piston which is peculiarly adapted to fulfill in an advantageous manner the various requirements made of it in an internal combustion engine. Where volume production is taken into consideration and efficiency and economy of manufacture becomes an absolute necessity, it will be found that applicant's invention

herein claimed has distinct advantages over any constructions of reference and any of which applicant has knowledge. The difficulty in producing a commercially satisfactory piston, particularly of an aluminum alloy, is widely known in the engineering profession. The problem has been one of the most serious confronting automotive engineers for some years. The simple solution which applicant has hit upon in this invention has proven its commercial merit and it is believed that the claims patentably distinguish from the references without any

question of a doubt.

Claim 2 specifies the relation of the connectors to the head and guide sections and also the relief of the guide sections adjacent the connectors.

The significance of claims 3 to 7, inclusive, will readily be understood from a reading of the explanatory statement inserted on page 8 of the specification.

Claims 8 and 9 specifically set forth that the connectors are not in alignment with the wrist pin bosses and form the sole connections between the parts.

Respectfully submitted,

LOUIS P. MOOERS,
By HAYNER H. GORDON,
Attorney.

Washington, D. C.
January 3, 1921.

Mail Room
Jan 4 1921
U. S. Patent Office

Louis P. Mooers,
Piston for Internal Combustion Motor
and Process of Making the Same,
Filed June 2, 1917,
Ser. No. 172,380.

OATH

STATE OF OHIO, }
COUNTY OF HAMILTON } ss.

LOUIS P. MOOERS, being duly sworn, deposes and says that he is the Louis P. Mooers who filed the above entitled application relating to Piston for Internal Com-

bustion Motor; that he is a citizen of the United States and resident of Cincinnati in the County of Hamilton and State of Ohio; that he verily believes himself to be the original, first and sole inventor of the improvement in Piston for Internal Combustion Motor shown and described in the above entitled application;

That the subject-matter set forth in claims 1, 2, 4, 6, 7, 8, 9, 10 and 11 was a part of his invention and was invented by him prior to the 31st day of January, 1917; that prior to the 31st day of January, 1917, he fully disclosed his said invention to E. E. Allyne, of Cleveland, Ohio, and others; that prior to January 31st, 1917, at the request of the said E. E. Allyne, he made full-sized working drawings of the said invention and sent the same from Cincinnati, Ohio, to the said E. E. Allyne at Cleveland, Ohio; that the photostat copy marked "Exhibit A," attached to and made a part of my affidavit dated Sep. 15, 1919 and filed therewith in the above entitled application, is a photograph of said drawings; that owing to conditions entirely beyond affiant's control, namely, those existing during and imposed by the war, affiant was

38B

unable to produce pistons embodying his idea, it being essential that they should be made out of aluminum and the plan in which the said E. E. Allyne was interested, where such pistons could be made, being wholly engaged in war work; that applicant made the invention at the request of the said E. E. Allyne for a piston which could be made of aluminum in a so-called permanent mold and that the said E. E. Allyne was president of the only Company in this country, within applicant's knowledge, where such molds were made; that with all reasonable dispatch after the armistice the said E. E. Allyne had pistons embodying applicant's said invention made and successfully tested at Cleveland, Ohio, and that affiant took all reasonable steps, under existing circumstances, to demonstrate the practicability of his idea and to reduce the same to practice; that the war conditions with which he had to contend prior to June 2, 1917, the date of the filing of his application, were such as to preclude earlier reduction to practice of his invention; that he does not know and does not believe that the invention has been in public use or on sale in this country, or patented or described in a printed publication in this or any foreign country for more than two years prior to this application; and that he has never abandoned the said invention.

Louis P. Mookes.

Sworn to and subscribed before me, a Notary Public, at Cincinnati, County of Hamilton and State of Ohio, this 17th day of January, 1920.

ANTHONY BLISTAIN,
Notary Public.
Hamilton County, Ohio
My Commission Expires
Oct. 13, 1921,

(Seal)

APPROVED,
March 3, 1921
Under Order 2255.

F. A. HOSTETLER,
Law Examiner.

39B

Account

Division 12, **Paper No. 8½**
Apr 21 1921
U. S. Patent Office

UNITED STATES PATENT OFFICE

Application of
LOUIS P. MOOERS,

"Piston for Internal Combustion Motor and Process for Making the Same,"

Attention: Official Draftsman.

Serial No. 172,380,
Filed June 2, 1917.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

Enclosed please find a print of a drawing in the above entitled application. Please instruct the Official draftsman to make corrections on Sheet 3, Figures 11 and 13, of the drawings as indicated on the accompanying print. Charge the cost of the same to the account of Gordon & Stewart.

Respectfully,
LOUIS P. MOOERS,
By HAYNER H. GORDON,
Attorney.

Washington, D. C.
March 1, 1921.

40B

Fig 10

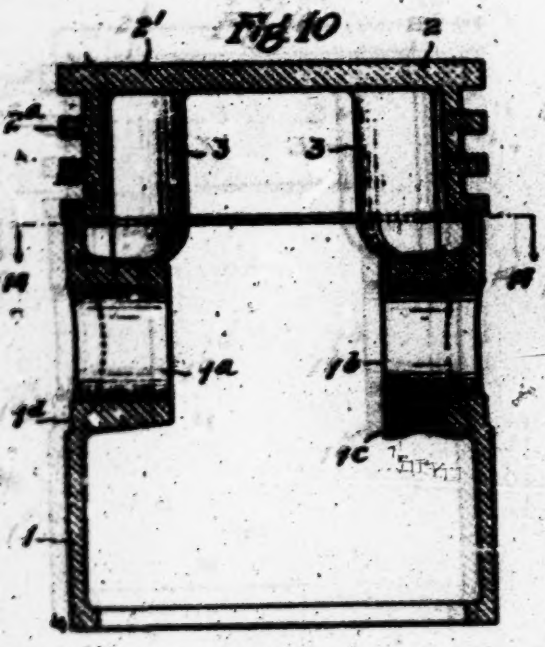


Fig. 11

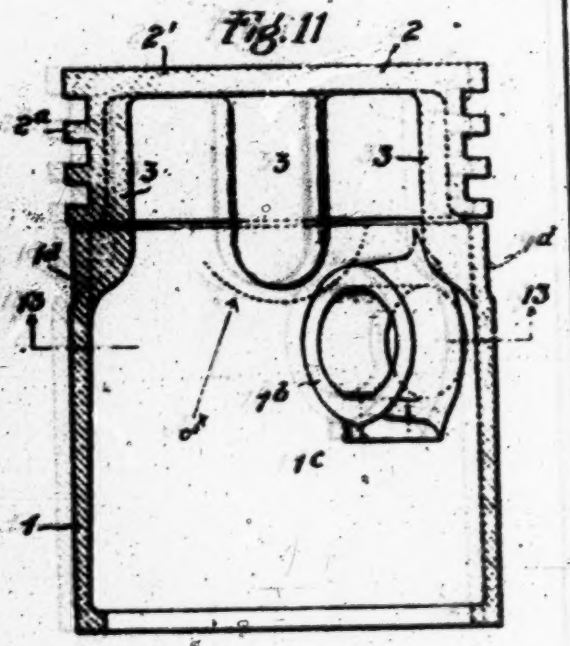


Fig. 12

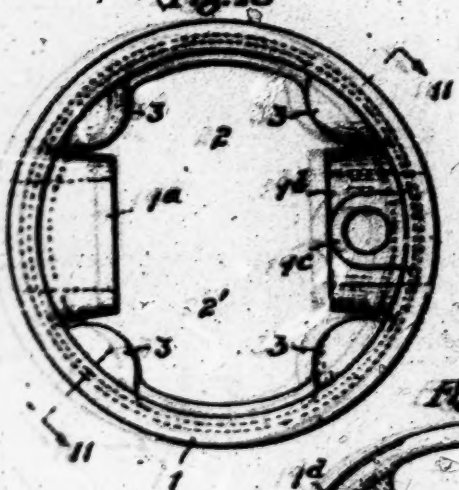


Fig. 13

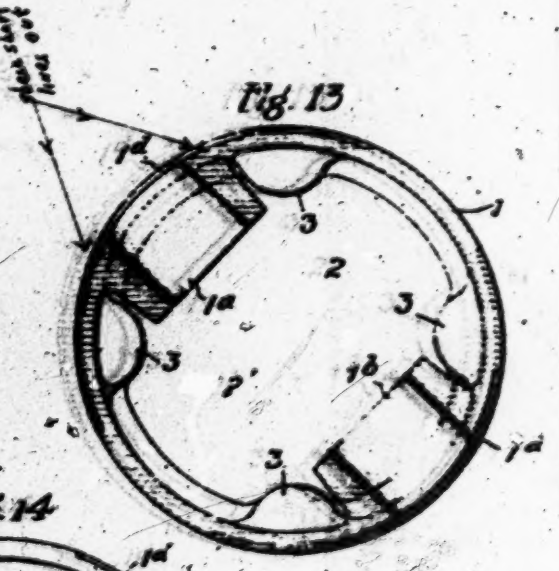
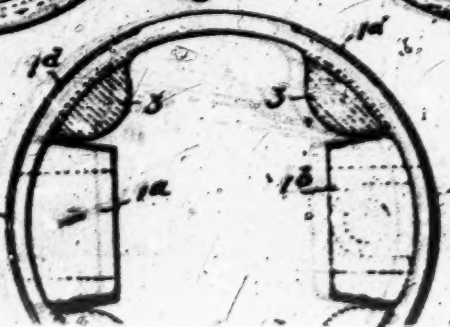
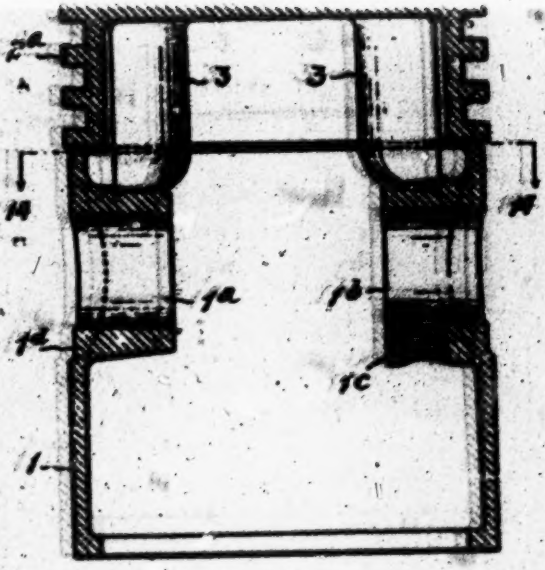


Fig 14



Inventor:
Louis P. Thomas



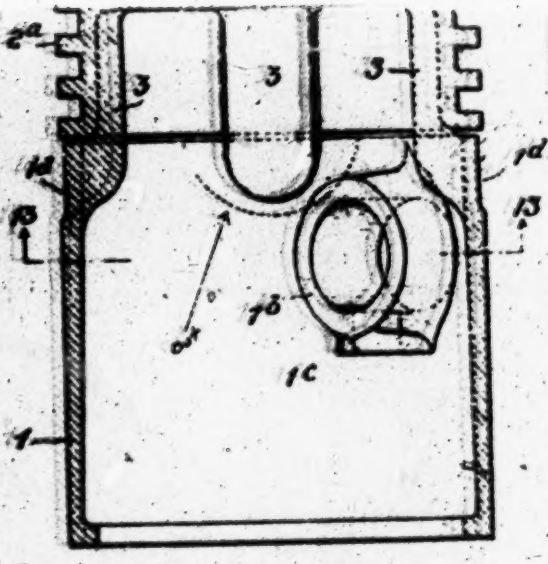


Fig. 12

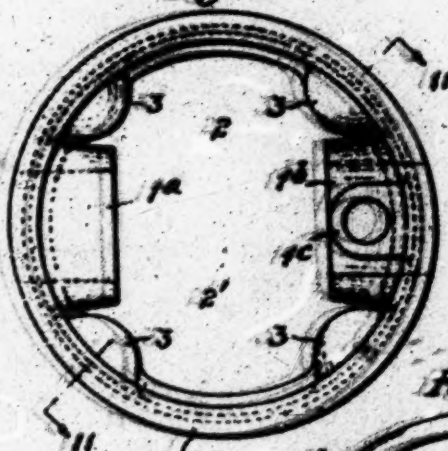


Fig. 13

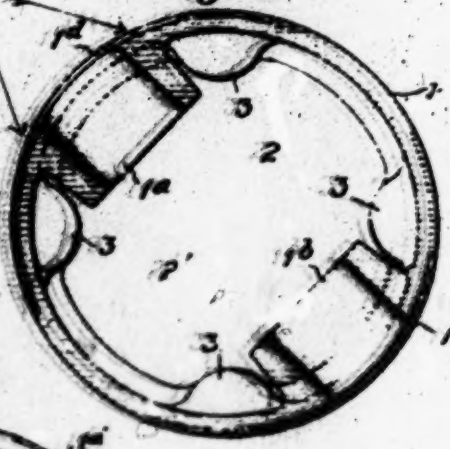
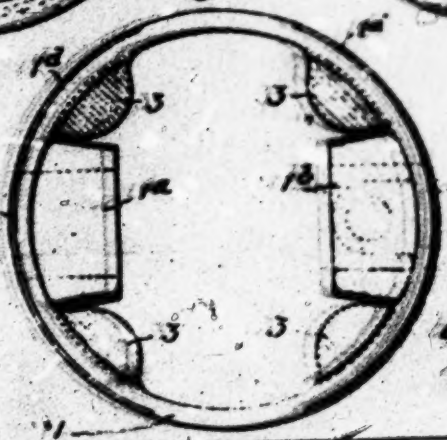


Fig. 14



Inventor:
Louis [illegible]
by Hayes & Gordon

Fig. 10

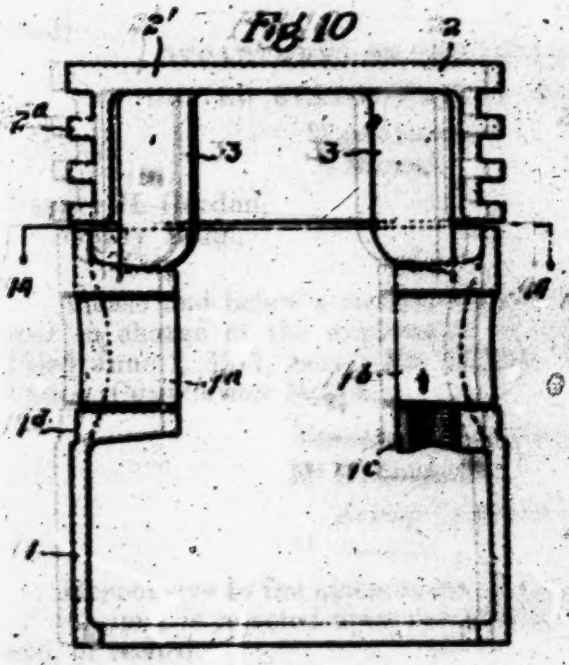


Fig. 11

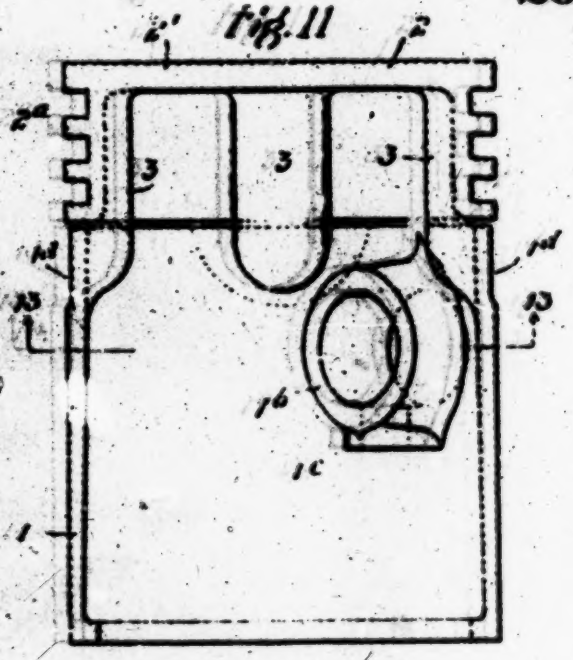


Fig. 12

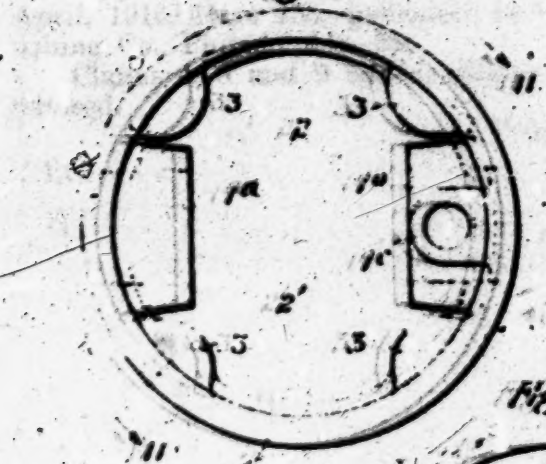


Fig. 13

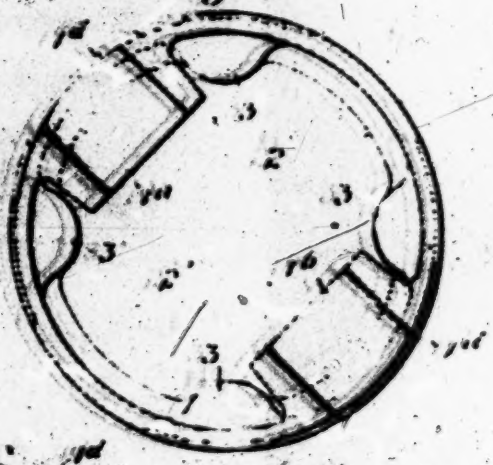
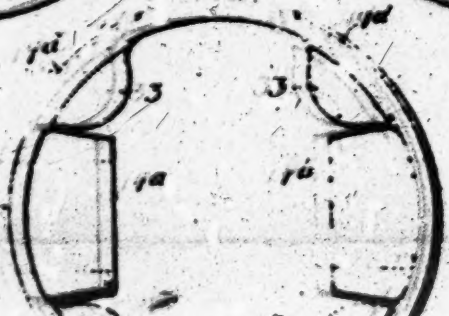
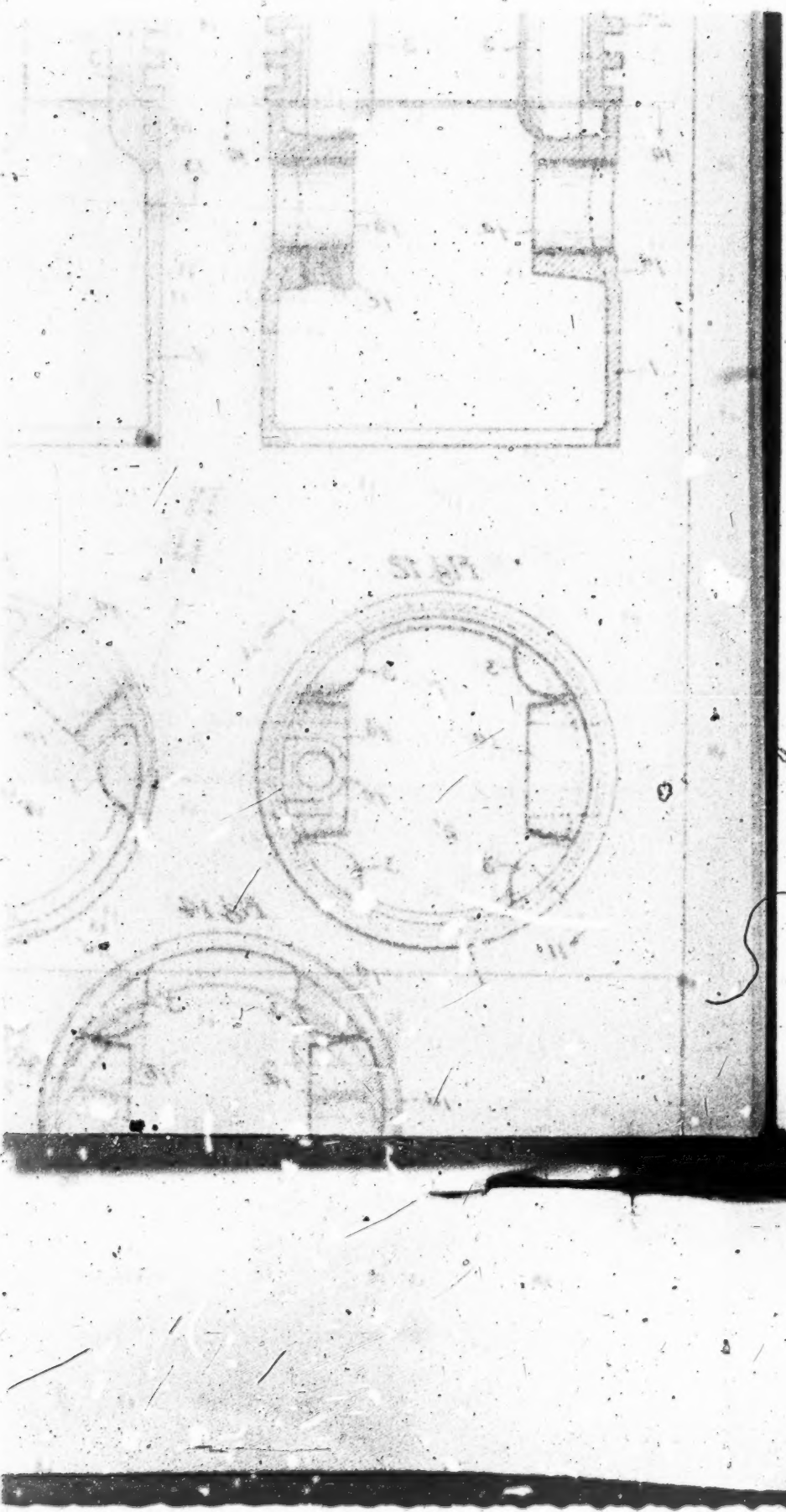
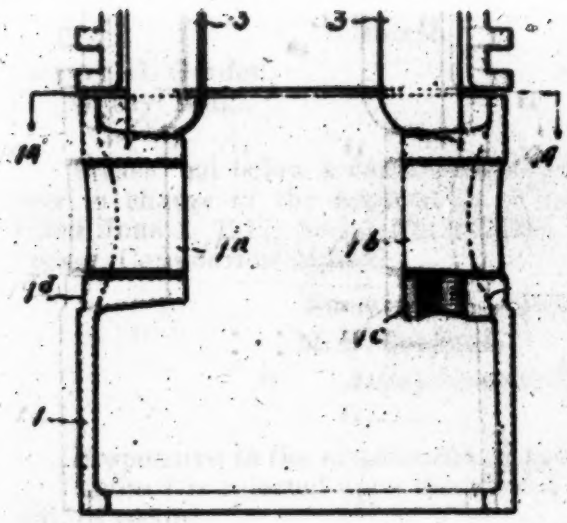


Fig. 14



Inventor





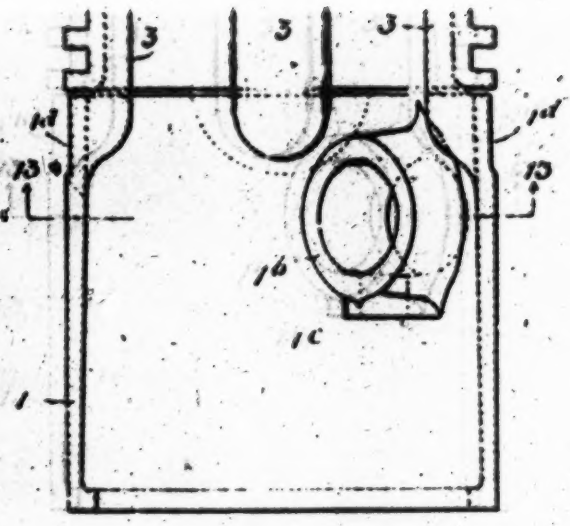


Fig. 12

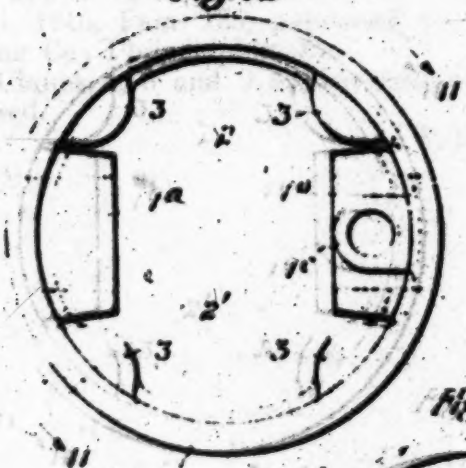


Fig. 13

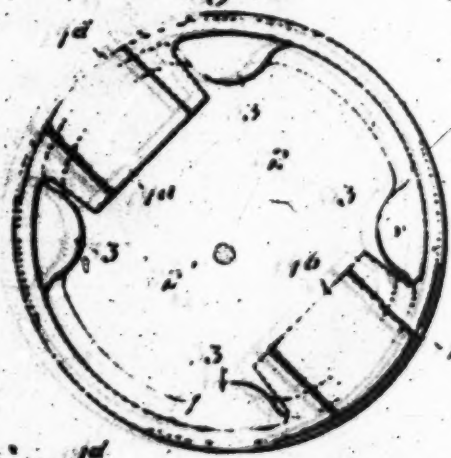
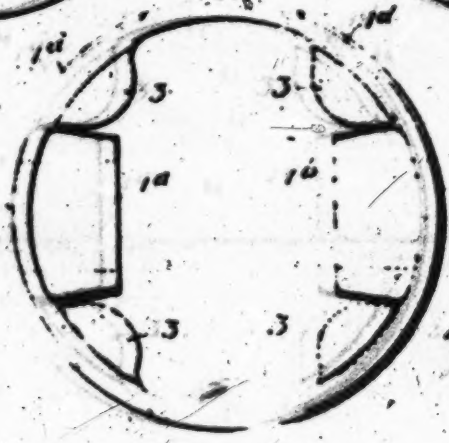
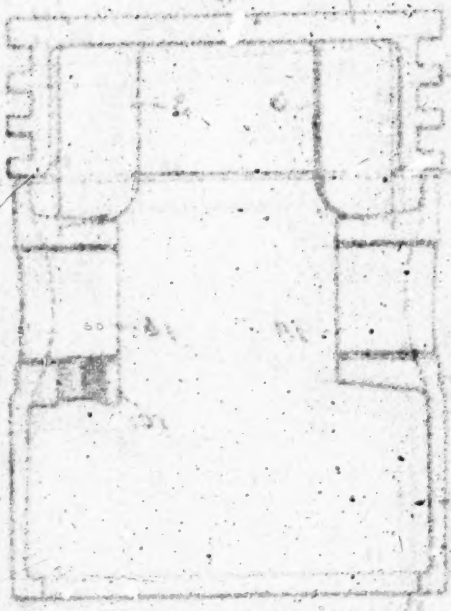
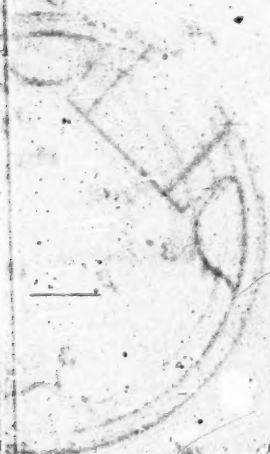


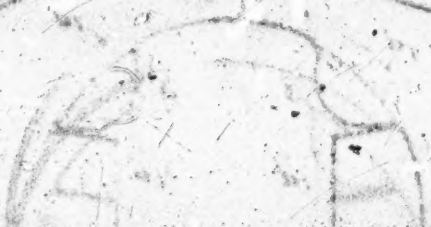
Fig. 14



Inventor
Witness,
Wayne H. Gordon
Attorney
43B







Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

WASHINGTON Mar. 3, 1921
MAILED " " "

Hayner H. Gordon,
Ouray Bldg.,
City.

Please find below a communication from the Examiner in charge of the application of Louis P. Mooers, Filed June 2, 1917, Serial No. 172,380, PISTON FOR INTERNAL COMBUSTION MOTOR.

~~THOMAS E. ROBERTSON,~~
M. H. Coulston,
Acting Commissioner of Patents.

Responsive to the amendment of Jan. 4, 1921.

Claim 1 is rejected upon the French patent to Chenard, of record.

Claim 2 is allowed.

Claims 3, 5, 6 and 7 are rejected as unpatentable over allowed claim 2 in view of either

Mort, 1,257,098, Feb. 19, 1918 (74-108) or the structure appearing in the Automobile Trade Journal, for April, 1916, Page 133, published by the Chilton Publishing Co., Philadelphia, Pa.

Claims 4, 8 and 9 appear allowable as at present advised.

P. P. PIERCE,
Examiner.

V.I.C.

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Application Div.
May 25 1921
U. S. Patent Office

Division 12, **Paper No. 10**

May 25 1921

IN THE UNITED STATES PATENT OFFICE

Application of
Louis P. Mooers,
Piston for Internal Combustion Motor
and Process of Making Same,
Filed June 2, 1917,
Serial No. 172,380.

ent. Cls.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

Responding to the Office letter of March 3, 1921, applicant amends as follows:

D

Page 1 of the specification, strike out lines 1, 2 and 3 and insert in lieu thereof the following:

D¹ —*The invention relates to improvements in pistons which are adapted especially for use in internal combustion motors.*—

Page 6, line 2, change "by" to —*of*—.

Page 9, lines 6 and 7, strike out "In my improved process of making a piston for an internal combustion motor the" and insert the following:

D² —*In making my improved piston, I prefer to employ the following process. The*—.

Claim 1, line 8, change "region" to —*regions*—.

Same claim, lines 9 and 10, strike out "the interior surface of the head and guide sections being freely accessible from the open end of the piston" and insert in lieu thereof

D³ —*there being no cored-out space between any of said connectors and the adjacent side walls of the head and guide sections*—.

Claim 2, line 8, change "region" to —*regions*—.

Claim 3, line 7, after "means" insert a comma.

Claim 5, line 7, change "walls" to —*wall*—.

Claim 6, line 9, after the comma insert

D⁴ —*there being no cored-out space between any of said con-*

nectors and the adjacent side walls of the head and guide sections and—.

Claim 7, line 11, strike out "in" and insert —*over continuous areas embracing*—.

Claim 8, line 7, after "with" insert —*the axes of*—.

Claim 9, line 9, before "wrist" insert —*axes of the*—.

The foregoing amendments are made pursuant to the oral interview with the Primary Examiner or May 10, 1921.

It is believed that claim 1 is now quite clearly and patentably distinguished from the French patent to Chenard.

Obviously, the piston shown in said French patent could not be produced in a permanent mold, while applicant's piston, as defined in claim 1, is very readily cast in a permanent mold.

Claims 3, 5, 6 and 7 are understood to have been rejected in the last Office action on the theory that they were distinguished from allowed claim 2 only with respect to the relief around the outer ends of the wrist pin bosses, the patent to Mort 1,257,098 and the cut in the Automobile Trade Journal being cited to show this relief feature per se. But, as was pointed out to the Examiner in the oral interview, this holding is not in accordance with the facts. Taking the claims individually, claim 3 differs very substantially in scope from claim 2. The latter claim calls for a continuous air gap and connectors springing from the side walls of the head and guide sections, while in claim 3, the air gap as defined may not be continuous circumferentially, and the connectors may not spring from the side walls. In other words, the relief of the guide section adjacent the boss is not the only and indeed not the main difference between the second and third claims.

Claim 5, similarly, differs from claim 2 in not being limited to connectors that "spring from the inner surface of the peripheral wall of the head section."

In claim 6, the connectors are not defined as in the regions of the bosses, as in claim 2. In addition, this claim is further distinguished by the above amendment.

Claim 7 is very materially distinguished from claim 2 in that the connectors are not defined as springing from the inner side walls of the sections, and also in specifying that the guide section is relieved over continuous areas embracing the regions of the boss and connecting means.

For the reasons above stated, it is believed that each of claims 3, 5, 6 and 7 are properly allowable, as well as

claim 2, and allowance of the application as now presented is respectfully solicited.

Respectfully yours,

Louis P. Mooers,
By Hayner H. Gordon,
Attorney.

Cleveland, Ohio,
May 20, 1921.

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2-181

Serial No. 172,380
Patent Office
Jun 3-1921
Mailed

Address only
The Commissioner of Patents,
Washington, D. C.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
WASHINGTON

June 3, 1921

Louis P. Mooers, Assr.

Sir: Your Application for a patent for an Improvement in Pistons For Internal Combustion Motor filed June 2, 1917, has been examined and Allowed.

The final fee, Twenty Dollars, must be paid not later than Six Months from the date of this present notice of allowance. If the final fee be not paid within that period, the patent on this application will be withheld, unless renewed with an additional fee of $15, under the provisions of Section 4897, Revised Statutes.

The office delivers patents upon the day of their date, and on which their term begins to run. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will require about four weeks, and such work will not be undertaken until after payment of the necessary fee.

When you send the final fee you will also send, Distinctly and Plainly Written, the name of the Inventor, Title of Invention, and Serial Number as Above Given, Date of Allowance (which is the date of this circular), Date of Filing, and, if assigned, the Names of the Assignees.

If you desire to have the patent issue to ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of final fee.

After issue of the patent uncertified copies of the drawings and specifications may be purchased at the price of TEN CENTS EACH. The money should accompany the order. Postage stamps will not be received.

Final fees will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

HAYNER H. GORDON,
Ouray Bldg.,
City.

☞ IN REMITTING THE FINAL FEE GIVE THE SERIAL NUMBER AT THE HEAD OF THIS NOTICE.

☞ UNCERTIFIED CHECKS WILL NOT BE ACCEPTED.

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DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
WASHINGTON

Dec. 1, 1921

PETITION:
Application of L. P. Mooers
Serial No. 172,380
Invention: .....

This petition is referred to the Examiner in charge of Division 12 for recommendation.

In case he recommends adversely he will state his reasons therefor ~~and furnish a copy thereof to petitioner~~ in accordance with Comm. order No. 2698.

~~THOMAS EWING,~~
Thomas E. Robertson,
Commissioner of Patents.

P. P. PIERCE.

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Application Div.
Dec 1 1921
U. S. Patent Office

Division 12, Paper No. 11
Dec 2 1921
U. S. Patent Office.

IN THE UNITED STATES PATENT OFFICE

Application of
Louis P. Mooers,

Piston for Internal Combustion Motor
and Process of Making Same,

Filed June 2, 1917
Serial No. 172,380

Amended under Rule 78.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In reviewing this application preparatory to the payment of the final fee, a typographical error has been noted in the specification, the use of different terms to refer to the same element has been found to exist in several of the claims and it has been deemed advisable that the patent should issue with several claims for narrower subject matter than called for by certain of the present allowed claims in order fully to protect the inventor.

Furthermore in view of the decision of the Circuit Court of Appeals, Second Circuit, in the case of Geo. Cutter Co. vs. Metropolitan Electric Manufacturing Company reported in volume 275, No. 2 of the Federal Reporter, page 158 published Nov. 17, 1921, it would seem to be incumbent upon every patent solicitor in order to fully protect his client wherever any amendments have been made to the original claims in the course of prosecution of the application and prior to the payment of the final fee, to file a supplemental oath with respect to the claims as finally allowed, as a matter of sheer precaution. Applicant's attorney believes the original oath herein to cover the claims finally allowed but there is no reason he knows of why he should take any chances in this respect and accordingly files herewith a supplemental oath covering the subject matter of the claims as they will issue.

Accordingly please amend as follows:

Page 5, line 10, after the word "skirt" insert the words —*other than*—

This corrects the typographical error above referred to. It is obvious that without these words the sentence does not make sense.

Claim 7, cancel the last line and insert the
E¹ words —*relieved over continuous areas each embracing the region of one of said bosses and the adjacent connecting means*—

The claim without this amendment does not appear to be grammatical.

Claim 8, cancel the word "skirt" in each instance where it appears in lines 2 and 6 and insert the word —*guide*— in each instance in lieu thereof;

Line 3, cancel the word "skirt" and insert the words —*guide section*—

Line 4, cancel from the word "and" through the word "thereof"; line 6, cancel the word "spaced" and insert the word —*separated*—

In this claim 8 in several places an element is referred to as a skirt and in the last line as a guide section. Certainly the same terms should be used to mean the same thing throughout the claim. Again it seems to be better to use the words "separated by an air gap" than "spaced by an air gap." The same corrections are made with respect to claim 9.

Claim 9, cancel the word "skirt" where it appears in lines 2, 6 and 7 and insert the word —*guide*— in each instance in lieu thereof;

Line 3, cancel the word "skirt" and insert the words —*guide section*—

Line 4, cancel from the word "and" through the word "thereof";

Line 6, cancel the word "spaced" and insert the word —*separated*—;

Line 7, cancel from the word "columns" through the word "bosses," line 9 and insert —*connectors between the peripheral wall of said head and the*
E² *guide section formed integral therewith and radially inset with respect to said peripheral wall*—

It is thought that the definition of the disposition of the columns in claim 9 might be misinterpreted as originally expressed but the proposed amendment should clearly avoid any misunderstanding.

Insert the following claims:

—10. An integrally cast piston comprising a head section having end and peripheral walls, a guide section separated at its upper edge from the lower edge of the peripheral wall of said head section by an air gap and provided with diametrically opposed wrist pin bosses and section connectors between the head section and the guide section in the regions of said wrist pin bosses, said connectors being disposed radially inside the air gap and there being no cored-out space between any of said connectors and the adjacent side walls of the head and guide sections.

E^3

11. An integrally cast piston comprising a head section having an end wall and a peripheral wall formed with a plurality of ring grooves, a guide section provided with diametrically opposite wrist pin bosses, and means connecting the head and guide sections in the regions of said bosses, the upper edge of the guide section and the lower edge of the head being separated in the regions between said connecting means by air gaps disposed below the lower-most of said ring grooves and the guide section being exteriorly relieved in the regions of the bosses and connecting means.

12. An integrally cast piston comprising a head section having end and peripheral walls, a guide section

—3— 52B

non-compressible circumferentially and provided with diametrically opposite wrist pin bosses, and means connecting the head and guide sections in the regions of said bosses, the upper edge of the guide section and the lower edge of the head being separated by an air gap in the regions between said connecting means and the guide section being exteriorly relieved in the regions of the bosses and connecting means.—

The three claims herewith submitted are more specific with respect to the subject matter involved than are claims 1, 3 and 4 respectively and they patentably differentiate therefrom. As above suggested, they are believed to be necessary fully to protect applicant's invention.

The review of this application which has been made in conference with the applicant, also has disclosed an inaccuracy in the oaths submitted with the amendments herein dated September 26, 1919 and January 4, 1921 respectively, in that the word "invention" where used in one place in each of said oaths should have been

"design shown by Exhibit A," reference to which is made in the supplemental oath filed herewith.

Respectfully submitted,
LOUIS P. MOOERS,
By HAYNER H. GORDON,
Atty.

Cleveland, Ohio.
Nov. 30, 1921.

53B

Application Div.
Dec 1 1921
U. S. Patent Office

Division 12, **Paper No.**
Dec 2 1921
U. S. Patent Office.

IN THE UNITED STATES PATENT OFFICE

Application of
Louis P. Mooers,

Piston for Internal Combustion Motor and Process of Making Same,
Filed June 2, 1917,
Serial No. 172,380

Hon. Commissioner of Patents,
Washington, D. C.

SIR:

It is respectfully requested that the accompanying amendment be entered in accordance with the provisions of Rule 78, without withdrawing the application from issue.

Respectfully submitted,
LOUIS P. MOOERS,
By HAYNER H. GORDON,
Attorney.

Washington, D. C.,
December 1, 1921.

ENTRY RECOMMENDED.
UNDER RULE 78.

P. P. PIERCE,
Examiner.

Approved
Dec 2-1921
THOMAS E. ROBERTSON,
Commissioner of Patents.

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Application Div.
Dec 1 1921
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

Application of
Louis P. Mooers,
Piston for Internal Combustion Motor
and Process of Making Same,
Filed June 2, 1917,
Serial No. 172,380

OATH

DISTRICT OF COLUMBIA, ss:

Louis P. Mooers, being duly sworn, deposes and says that he is the Louis P. Mooers who filed above entitled application for Letters Patent; that the subject matter of each amendment to the said application which has been made, including the amendment dated November 30, 1921, was part of his invention, was invented before he filed his original application, above identified, for such invention; that his invention as set forth in the specification and described and claimed in the twelve claims of the application as amended by the said amendment dated November 30, 1921, was not known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof or more than two years prior to the original filing of his application above identified, or in public use or on sale in the United States for more than two years prior to the original filing of said application; that said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; that no application for patent on said invention has been filed by him or his representatives or assigns

55B

in any country foreign to the United States; and that said invention has not been abandoned.

Affiant further states that preparatory to paying the final fee in his application above identified, affiant has carefully reviewed the record thereof and has noted in connection with his affidavits filed with the amendments of September 26, 1919 and January 3, 1921, respectively,

an error, namely, that the word "invention" where it appears in line 6, page 2 of the first affidavit and in line 5, page 2, of the second affidavit should have been the words —*design shown by Exhibit A*—; that as a matter of fact affiant made the invention in question long prior to the said request of the said E. E. Allyne; that affiant's attorney who prepared the oaths in question was not aware of this fact and prepared said oaths in ignorance thereof, and that affiant did not note the error until reviewing the records of the application as above stated, and that he now makes oath with respect to said error in order to correct his application record in this respect.

LOUIS P. MOOERS.

Sworn to and subscribed before me this 1st day of December, 1921.

CORA VAN SANT,
Notary Public.

(Seal)

—2— 56B

2-261-a

Address only
Commissioner of Patents
Washington, D. C.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

P-D

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE
WASHINGTON

Dec. 2, 1921

Hayner H. Gordon,
Ouray Bldg.,
City.

In the application of Louis P. Mooers, Filed June 2, 1917, Serial No. 172,380, PISTON FOR INTERNAL COMBUSTION MOTOR Allowed June 3, 1921, The amendment filed Dec. 1, 1921 has been entered under Rule 78.

THOMAS E. ROBERTSON,
Commissioner of Patents.
P. P. PIERCE.

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2-327.

$20—Rec'd
Dec 2 1921 U
C. C. U. S. Pat. Office

MEMORANDUM OF FEE PAID AT UNITED STATES PATENT OFFICE.

(Be careful to give correct Serial No.)

Serial No. 172380, 19.

Inventor:
Louis P. Mooers

Patent to be Issued to
The Cleveland Trust C,

Name of Invention, as Allowed:
Piston for Internal Combustion Motor

Date of Payment:
Dec. 2-1921

Fee:
$20.

Date of Filing:
June 2-1917

Date of Circular of Allowance:
June 3-1921

The Commissioner of Patents will please apply the accompanying fee as indicated above.

HAYNER H. GORDON,
Attorney.

Send Patent to
Hayner H. Gordon,
Ouray Bldg.,
Washington, D. C.

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PRINTERS' NOTE:

A copy of U. S. Patent No. 1,402,309, Jan. 3, 1922, to L. P. Mooers, was bound into the original of this Exhibit at this point, but inasmuch as it appears, *supra*, page 1309, as Plaintiffs' Exhibit No. 6, it has been omitted to comply with the Equity Rule against duplication.

74. Machine Elements.
108

1917

CONTENTS:

1. Application 1 papers.
2. Letter June 2, 1917
3. Rej. Jul 20 1917
4. Amendment A. July 10, 1918
5. Rej Sep 28 1918
6. Amendment B and Affidavit Sep. 26/19
7. Rej Jan 6-1920
8. Amendment C and Affidavit Jan. 4, 1921
8½. Letter to Office. March 1, 1921
9. Rej. Mar 3-1921
10. Amendment D May 25, 1921
11. Amendment (R. 78) E and Sup. Oath, Dec 1/21
12. Notice of Entry of Amdt. (R. 78) Dec 2, 1921

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DEFENDANTS' EXHIBIT 4-L.

File Wrapper and Contents of Jardine Patent in Suit.

(Filed January 27, 1934.)

390

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of the File Wrapper and Contents, in the matter of the Letters Patent of Frank Jardine, Assignor, by Mesne Assignments, to The Cleveland Trust Company, as Trustee, Number 1,763,523, Granted June 10, 1930, for Improvement in Pistons.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this fourteenth day of January, in the year of our Lord one thousand nine hundred and thirty-three and of the Independence of the United States of America the one hundred and fifty-seventh.

THOMAS E. ROBERTSON,
Commissioner of Patents.

(Seal)

ATTEST:

D. E. WILSON,
Chief of Division.

1920
RENEWAL

Number (Series of 1915), 1763523
~~364997~~ ~~450698~~ (Ex'r's Book) 162-44-D
Div. 12 Patent No. 1763523
Jun 10 1930

Name Frank Jardine, Assor. by mesne assigts. to ~~Aluminum Manufactures, Company of America, Incorporated, of Cleveland, Ohio, Pittsburgh, Penna.,~~ a

~~corp. of Delaware, Pennsylvania.~~ The Cleveland Trust Company; of Cleveland, Ohio, a corp. of Ohio, as Trustee.
of Cleveland,
County of
State of Ohio.
Invention Pistons.

PARTS OF APPLICATION FILED.

	ORIGINAL		RENEWED	
Petition	Mar. 11, 1920			Mar. 9, 1921
Affidavit	" ", 1920			, 192
Specification	" ", 1920			, 192
Drawing 2 shts.	" ", 1920			, 192
Photo Copy	May 18, 1923			, 192
First Fee Cash $15.	Mar. 11, 1920	$15,		Mar. 8, 1921
" " Cert.	, 192			, 192
Appl. filed complete	Mar. 11, 1920			Mar. 9, 1921

Examined and Passed for Issue Sept. 8, 1920 — May 9, 1930
P. P. Pierce Exr. Div. 12 — P. P. Pierce Exr. Div. 12
Notice of Allowance Sept 8-1920 By Commissioner. — May 9, 1930 By Commissioner.
Final Fee Cash , 192 — $20 May 15, 1930
" " Cert. , 192 — , 192
Patented Jun 10 1930
Attorney ~~Ray Stewart Gehr~~
~~Euclid Bldg., Cleveland Ohio~~
~~Associate~~ Attorney ~~L. D. Watts, 307 Banger Bldg.,~~
~~451 Lennox Building, East 9th & Euclid Ave.,~~
(No. of Claims Allowed ~~7~~ 12) Print Claims ~~5~~ 1 in O. G.
(Cl ~~74~~ 108)
Title as Allowed Pistons
Substitute Attys. Richey, ~~Slough~~ & Watts, ~~1213 Ulmer Bldg.,~~
1983 Union Trust Bldg Cleveland, Ohio
Division of App., No....., filed ....., 191..

($15 Rec'd Mar 11 1920 C. C. U. S. Pat. Office)

Ch

Mar 15 1920
U. S. Patent Office
Cleveland, Ohio
364997

RAY STEWART GEHR
COUNSELLOR AT LAW

Washington
Ouray Building

Patents and
Patent Causes

Cleveland
Garfield Building

March 9, 1920.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

I enclose herewith for filing petition, specification, oath and drawings, also check for $15.00 constituting the application of Frank Jardine for patent on Pistons.

Respectfully yours,
RAY S. GEHR.

RSG FR
Enclosures

364997—1

I 884
364997

(Mail Room Mar 11 1920 U. S. Patent Office)

Insert
523

Division 12, Paper No. 1
Mar 15 1920
U. S. Patent Office

PETITION.

To THE COMMISSIONER OF PATENTS:

Your petitioner, FRANK JARDINE, a citizen of the United States and a resident of Cleveland, in the County of Cuyahoga and State of Ohio, whose post-office address is care of The Aluminum Castings Company, Cleveland, Ohio, prays that Letters Patent may be granted to him for the improvement in Pistons, set forth in the annexed specification; and he hereby appoints Ray Stewart Gehr, of 1900 Euclid Building, Cleveland, Ohio, his attorney with full power of substitution and revocation, to prosecute this application, to make alterations and amend-

ments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

Signed at Cleveland, County of Cuyahoga, State of Ohio, this 9th day of March 1920.

FRANK JARDINE.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN:

Be it known, that I, Frank Jardine, a citizen of the United States, residing at Cleveland, in the County of Cuyahoga, and State of Ohio, have invented certain new and useful improvements in pistons, of which the following is a specification, reference being had therein to the accompanying drawings.

364997—2

(Hir.) I 885

My invention relates to pistons for internal combustion engines and especially to pistons formed of light weight metals or alloys.

The invention has for its chief object the construction of a light alloy piston which, with relatively small initial clearance, will operate satisfactorily at all temperatures in an engine cylinder.

Another object of the invention is to produce a piston of the character noted that will lend itself to economic methods of manufacture.

Because of the high co-efficient of expansion of suitable light alloys such as aluminum alloys, as compared with iron, it is often difficult to fit an internal combustion engine satisfactorily operable with iron pistons, with light alloy pistons so that such pistons will not be noisy and will not pump oil when cold, or will not stick or score the cylinder wall when heated. I have found that these difficulties can be overcome by constructing a piston with its skirt or guide portion supported and slotted or divided in a manner to permit deformation and deflection of parts thereof without interfering with the performance of the essential functions of the respective parts.

To facilitate an understanding of the invention two forms or embodiments thereof are described hereinafter and are illustrated in the accompanying drawings in which

Fig. 1 is a view partly in side elevation and
per B partly in section of a ~~"slipper" type~~ piston constructed in accordance with my invention.

Fig. 2 is a side elevation of the same piston viewed at right angles to Fig. 1.

Fig. 3 is a section on the line 3—3 of Fig. 1.

Fig. 4 is a section on the line 4—4 of Fig. 1.

364997—3

I 886

Fig. 5 is a section on the line 5—5 of Fig. 1.

Fig. 6 is a view partly in side elevation and
per B partly in section of a ~~"slipper" type~~ piston of modified form.

Fig. 7 is a side elevation of the same viewed at right angles to Fig. 6 and with parts broken away and shown in section.

Fig. 8 is a section on line 8—8 of Fig. 6.

Fig. 9 is a section on line 9—9 of Fig. 6.

Referring first to Figs. 1 to 5, the piston
per B shown ~~is of the so-called slipper type and~~ com-
" B prises a head portion 1 and a guide ~~or skirt~~ portion designated in its entirety by 2. The head portion consists of a head disc 3 and a peripheral flange 4 in which are grooves 4a for the ordinary piston rings 5. On the lower face of the head disc 3 are formed two depending webs 6 integral with the disc. These webs carry bosses 7 which are adapted to receive the ordinary wrist pin. Ribs 8 may be provided along the webs 6 between the head disc and the bosses for strengthening the webs 6 and supporting the inner ends of the bosses. Additional ribs 9 may be formed on the outer sides of webs 6 as shown to strengthen them and to support the outer ends of the bosses.

The guide portion 2 comprises two pairs of
per B ~~slipper~~ guide segments 10 and 10a curved to conform to the engine cylinder, one pair being located on either side of the bosses. The segments are integral with the webs 6 and are supported and connected to the head portion 1 by means of these webs. The segments at their upper ends are separated from the flange 4 of head portion 1 by slots 11 and are further isolated from the head by slots 11a formed in webs 6. The segments of each pair are separated from one another by a longitudinally extending slot 12, said slot preferably being inclined or spirally arranged as shown. In the construc-

364997—4

per B tion shown the guide ~~slipper~~ portion formed by

I 887

segments 10a is designed to take the diagonal thrust of the piston rod during the compression stroke of the engine and as said thrust is less than the corre-
44 sponding thrust during the explosion stroke, said
per B ~~slipper~~ portion 10a is made narrower circumfer-
" B entially than the other ~~slipper~~ portion 10 so as to save weight.

The flange 4 of the head portion 1 has a smaller outer diameter than the guide portion 2, the diameter of the latter being only slightly smaller than the internal diameter of the cylinder in which it is to function.

In the operation of an internal combustion engine the piston usually is heated to a higher temperature than the cylinder wall and expands radially to a greater amount than the cylinder. This expansion reduces the clearance between the piston skirt or guide part and the cylinder wall and in the case of pistons not constructed according to my invention, if the initial clearance provided is small, scoring of the cylinder walls or piston, or seizure of the piston in the cylinder may result. With my invention, however, the guide segments 10, 10a, are capable of deformation or displacement as the piston guide parts expand, the segments being forced toward one another so as to tend to close up the slots 12. The
per B webs 6 and ~~slipper~~ guide segments preferably are so designed that this displacement of the segments 10, 10a, is permitted by virtue of a bending of the
per B webs 6 at points remote from the ~~slipper~~ guide
" B segments. To this end, as shown in Fig. ~~5~~, 4 the
per A thickness of the ~~slipper~~ guide segments is increased toward the webs 6 and the webs 6 are de-
" B creased in thickness from the ~~slippers~~ guide portions inward toward the bosses to points in line with the inner ends of the slots 11a. This gives in effect a cantilever structure weakest at its support,
per A namely, along the dotted lines 13 in Figs. ~~3.~~ 1 and 4 Thus the reaction force of the cylinder wall on the
" B outer faces of the ~~slipper~~ guide segments as the

I 888

piston expands tends to cause bending of the webs 6 along said lines 13. Due to the bending of the web sections 6 and the forcing together of each pair of seg-

ments, the guide part of the piston may undergo a considerable thermal expansion without a corresponding increase in the outer diameter thereof and thus a small initial clearance can be used without danger of scoring or seizure of the piston.

By variation of the thickness and design of the webs 6 and the location of the slots 11a therein, the force necessary to cause the guide segments 10 and 10a to approach one another along the slot 12, or in effect to maintain the outer diameter of the piston substantially constant, can be easily regulated. The webs 6 will tend to bend along a line extending vertically downward from the ends of slots 11a and if said slots are terminated closer to the guide segments 10, 10a the region of bending will be moved outward correspondingly. Likewise a thickening of the webs 6 near the bosses will tend to move the point of bending or flexing closer to the guide segments 10, 10a. An increase of the thickness of the webs 6 obviously will increase the force necessary to cause the guide segments 10, 10a to approach one another along the slot 12.

In Figs. 6 to 9 a modified form of piston is shown. The head portion 21 is formed with a head disc 22 and a depending peripheral flange 23 in which may be formed grooves 24 for the ordinary piston rings. Depending webs 25 are formed at diametrically opposite parts of the lower edge of the peripheral flange 23. These webs carry bosses 26 for the customary wrist pin, the inner ends of the bosses being supported by ribs 27 which join the webs 25 and extend from the inner ends of the bosses 26 to the lower side of the head disc 22, while the outer ends of said bosses are supported by ribs 27a.

On either side of the bosses 26 are formed pairs of guide segments 28 and 28a similar to those shown in

Figs. 1 to 5. These segments are united with webs 25 as shown and are separated from the flange 23 by slots 29 and further isolated from the head by slots 29a in the walls 25. The guide segments of each pair are separated from one another by longitudinally extending slots 30.

It will be seen that this last form of construction is based upon the same principles as the first form and further detailed description is therefore unnecessary. The main difference between the last form of construction and that first described resides in the webs 25 which

support the wrist pin bosses and the guide
per B slippers, portions said walls being joined to the
41 head structure at the lower edge of the ring flange 23 rather than springing from the head disc as in the first form of construction.

From the foregoing description the operation of pistons embodying my improvements will readily be understood. It will be seen that an aluminum alloy piston embodying my invention can be fitted to the engine cylinder with a very small clearance and that compensation for the relatively large thermal expansion of the guide section of the piston is provided by the displacement of the guide segments which results from the reaction force of the cylinder wall on the outer faces of the guides. As above indicated the reaction force necessary to displace the guide parts and effect such compensation can readily be controlled by properly forming and proportioning the guide parts. In this connection it will be obvious to the designer that account must be taken of such factors as compression pressures, piston diameter and piston stroke as determining the lateral thrust to which the guide parts will be subjected. It is obvious that the compensating displacement of the guide parts should require a thrust great enough to insure adequate mechanical strength of the piston and small enough to obviate scoring of the piston and cylinder or seizure of the

piston.

While I have shown my invention applied to the slipper type of piston as distinguished from the skirt type it is to be understood that the invention is essentially applicable to other forms of construction, the scope of the invention being indicated by the appended claims.

What I claim is—(B' Cls. 1-2)

1. In a piston for an internal combustion engine, the combination of a piston head comprising a disc having an integral peripheral flange formed with ring grooves, piston rings in said grooves, two pairs of curved members oppositely disposed with relation to the axis of the piston and together adapted to function as a cylinder-engaging guide, each pair of curved members being separated from the head flange and from each

Per C other by continuous air gaps, two webs which are integral with and spring from the head disc each being connected to and integral with one of the guide members of each of said pairs thereof and constituting the only connection between the face of the piston head disc and the guide members, and wrist pin bosses formed in these webs in which they are so positioned as to lie between the pairs of guide members as set forth.

2. In a piston for an internal combustion engine, the combination of a piston head comprising a disc having an integral peripheral flange formed with ring grooves, two pairs of curved members oppositely disposed with relation to the axis of the piston and together adapted to function as a cylinder-engaging guide, each pair of curved members being separated from the head flange and from each other by continuous air gaps, two webs which are integral with the piston head, each being connected to and integral with one of the guide members of each of said pairs thereof and constituting the only connection between the piston head and the guide members, and wrist pin bosses formed in these webs in which they are so positioned as to lie between the pairs of guide members as set forth.

3. In a piston for an internal combustion engine, the combination of a piston head comprising a disc having an integral peripheral flange formed with ring grooves, two pairs of curved guide members oppositely disposed with relation to the axis of the piston and together adapted to function as a cylinder-engaging guide, the curved members of each pair thereof being separated from the head flange and from each other by continuous air gaps, two webs integral with the piston head and connected to the adjacent guide members, and wrist pin bosses formed in these webs in which they are so positioned as to lie between the pairs of guide members as set forth.

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I 892

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4. 1c In a piston for an internal combustion engine, the combination of a piston head having a depending ring flange, two pairs of curved guide members oppositely disposed with relation to the axis of the piston, the curved members of each pair thereof being separated Per A from the ~~head~~ ring flange and from each other

Per G

by continuous air gaps, and webs carrying wrist pin bosses, the said curved members, piston head and webs being united in an integral unitary structure.

Per C

5. In a piston for an internal combustion engine, the combination of a piston head comprising a head disc and a depending peripheral flange formed with ring grooves, and a guide formed integrally with the head and comprising two pairs of cylinder-engaging curved members oppositely disposed with relation to the axis of the piston and two webs each connected to the head and to one of the guide members of each of said pairs thereof, each pair of curved members being separated from the head flange and from each other by continuous air gaps, and wrist pin bosses formed in the webs in which they are so positioned as to lie between the pairs of guide members as set forth, the said guide structure being adapted to permit the curved members of each pair to approach each other under the reaction forces of the cylinder when the piston is heated.

Per H

6. 2c In a piston for an internal combustion engine, the combination of a piston head comprising a head disc and a depending peripheral flange formed with ring grooves, curved guide members separated from the piston head by air gaps, webs in which wrist pin bosses are formed, the curved members, piston head and webs being integrally united and formed in such a manner that the said members on either side of the said bosses may approach each other as the piston expands to maintain substantially constant the diameter of the said curved members when taken together.

364997—10

Per C

7. In a piston for an internal combustion engine, the combination with a piston head comprising a disc and a depending peripheral flange formed with ring grooves, of a guide structure operably connected to the head and comprising two pairs of cylinder-engaging curved parts and two webs each connected to one curved member of each pair and formed with a wrist pin aperture, each pair of curved guide parts being separated from the head flange and from each other by continuous air gaps and the guide structure being

adapted to permit the curved guide members of each pair to approach each other under the reaction forces of the cylinder when the piston is heated.

Insert A[1]

364997—11
I 894

IN TESTIMONY WHEREOF, I hereunto affix my signature.

FRANK JARDINE.

OATH

COUNTY OF CUYAHOGA,
STATE OF OHIO, ss.

FRANK JARDINE, the above named petitioner, being duly sworn, deposes and says he is a citizen of the United States and a resident of Cleveland, in the County of Cuyahoga and State of Ohio; that he verily believes himself to be the original, first and sole inventor of the improvement in Pistons, described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvement has been filed by him or his legal representatives or assigns in any country foreign to the United States.

FRANK JARDINE.

Sworn to and subscribed before me this 9th day of March, 1920.

GEO. B. PITTS,
Notary Public.

(Seal)

364997—12

(Mail Room Jun 19 1920 U. S. Patent Office)
(Docket Clerk Jun 19 1920)

#2
Doc

Frank Jardine,
Pistons,
Ser. No. 364,997,
Filed March 11, 1920.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

All Powers of Attorney previously granted in this application are hereby revoked.

I hereby appoint B. D. Watts, of ~~1990 Euclid Avenue,~~ 307 Bangor Bldg. Cleveland, Ohio, my attorney with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

Signed at Cleveland, in the County of Cuyahoga and State of Ohio, this 14th day of June, 1920.

FRANK JARDINE.

(U. S. I. R. Documentary Stamp, 25 Cents)
(Accepted Jun 22 1920 R. F. Whitehead
First Assistant Commissioner.)

364997—13

2—069

146
EEG

#3

Address only
The Commissioner of Patents
Washington, D. C.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington, D. C., June 23, 1920.

You are hereby informed that YOUR POWER OF ATTORNEY HAS BEEN ~~REVOKED~~ / ACCEPTED in the matter of the

application of Frank Jardine for Letters Patent for an IMPROVEMENT IN Pistons, No. 364,997, Filed March 11, 1920.

Very respectfully,

JAMES T. NEWTON,
Commissioner.

B. D. WATTS,
307 Bangor Bldg.,
Cleveland, Ohio.

364997—14

2—069

145
EEG

Address only
The Commissioner of Patents
Washington, D. C.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C., June 23, 1920.

You are hereby informed that YOUR POWER OF ATTORNEY HAS BEEN {REVOKED / ~~ACCEPTED~~} in the matter of the application of Frank Jardine for Letters Patent for an IMPROVEMENT IN Pistons, No. 364,997, Filed March 11, 1920.

Very respectfully,

JAMES T. NEWTON,
Commissioner.

RAY STEWART GEHR,
Euclid Bldg.,
Cleveland, Ohio.

364997—15

(Mail Room Jul 12 1920 U. S. Patent Office)

Division 12, Paper No. 4
Jul 13 1920
U. S. Patent Office

BLYTHE D. WATTS
Solicitor of Patents
~~1900 Euclid Ave.~~
Cleveland, Ohio
451 Lennox Bldg.,

July 9th, 1920.

In Re Application of
Frank Jardine,
Pistons,
Serial No. 364,997,
Filed March 11, 1920

Hon. Commissioner of Patents,
Washington,
D. C.

Dear Sir:—

In the above identified application, kindly note that my address has been changed from,

Room 307 Bangor Bldg., 942 Prospect ave.,
Cleveland, Ohio

to

Room 451 Lennox Bldg., East 9th & Euclid Ave.,
Cleveland, Ohio.

Yours very truly,

BDW
kmc

B. D. Watts,

364997—16

(Patent Office Sep 8-1920 Mailed)
2—181

Div. 12
Ch:I Serial No. 364,997

Address only
The Commissioner of Patents,
Washington, D. C.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington, Sept. 8, 1920.

Frank Jardine,

Sir: Your Application for a patent for an Improvement in Pistons filed Mar. 1, 1920, has been examined and Allowed.

The final fee, Twenty Dollars, must be paid not later than Six Months from the date of this present notice of allowance. If the final fee be not paid within that period, the patent on this application will be withheld, unless renewed with an additional fee of $15, under the provisions of Section 4897, Revised Statutes.

The office delivers patents upon the day of their date, and on which their term begins to run. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will require about four weeks, and such work will not be undertaken until after payment of the necessary fee.

When you send the final fee you will also send, Distinctly and Plainly Written, the name of the Inventor, Title of Invention, and Serial Number as Above Given, Date of Allowance (which is the date of this circular), Date of Filing, and, if assigned, the Names of the Assignees.

If you desire to have the patent issue to Assignees, an assignment containing a Request to that effect, together with the Fee for recording the same, must be filed in this office on or before the date of payment of final fee.

After issue of the patent uncertified copies of the drawings and specifications may be purchased at the price of ~~Five~~ Ten Cents Each. The money should accompany the order. Postage stamps will not be received.

Final fees will Not be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Respectfully,

~~James T. Newton,~~

R. F. Whitehead.

Commissioner of Patents.

B. D. Watts,
451 Lennox Bldg., East 9th & Euclid Ave.,
Cleveland, Ohio.

☞ In Remitting the Final Fee Give the Serial Number at the Head of This Notice.

☞ Uncertified Checks Will Not Be Accepted.

364997—17

($15 Rec'd Mar 8 1921 C. C. U. S. Pat. Office 26)
(Application Div. Mar 9 1921 U. S. Patent Office)

Renewal

Division 12, **Paper No. 5**
Mar 16 1921
U. S. Patent Office.

RENEWAL PETITION

To the Commissioner of Patents:

Your petitioner, Frank Jardine, a citizen of the United States, and a resident of Cleveland, in the County of Cuyahoga, and State of Ohio, whose post-office address is Care of the Aluminum Castings Company, Cleveland, Ohio, represents that on the 11th day of March 1920, he filed an application for Letters Patent for an improvement in Pistons, Serial No. 364,997 which application was allowed September 8th 1920, but that he failed to make payment of the final fee within the time allowed by law. He now makes renewed application for Letters Patent for said invention, and prays that the original specification, oath and drawings, may be used as a part of this application.

Signed at Cleveland, in the County of Cuyahoga and State of Ohio, this 7 day of March 1921.

FRANK JARDINE,
By B. D. WATTS,
His Attorney.

Pet. redated Mar. 9, 1921 as case had not forfeited on date petition was rec'd Mar. 8/21.

Appl'n Div. P
364997—18

(Mail Room Mar 8 1921 U. S. Patent Office)
Division 12, **Paper No. 6**
Mar 16 1921
U. S. Patent Office.

In Re Application of
Frank Jardine,
PISTONS
Serial No. 364,997
Filed March 11th 1920
Allowed September 8th 1920
Renewed

Hon. Commissioner of Patents,
Washington,
D. C.

Sir:

Applicant amends the above identified application as follows:

Page 3, line 25 cancel "5" and insert, —4—.

Page 3, next to last line, change "Fig. 3", to —*Figs. 1 and 4*—.

Claim 4, line 5 cancel "head" and insert —*ring*—.

Enter the following claims as claims, 8, 9, 10 and 11.

Sub B' A' 8. —In a piston for an internal combustion engine, the combination of a substantially cylindrical piston head having grooves therein, piston rings in said grooves, a skirt for said piston head connected to the same, piston pin bosses in said piston, the portions of the skirt adjacent the outer ends of the bosses, being relieved all along the length of

the skirt, said piston being provided with horizontal slots adjacent the junction of the head and the skirt and

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with a vertical, or substantially vertical, slot extending thruout, or substantially thruout, the length of the skirt.

9. —In a piston for an internal combustion engine, the combination of a substantially cylindrical piston head having grooves therein, piston rings in said grooves, a skirt for said piston head connected to the same, piston pin bosses in said piston, the portions of the skirt adjacent the outer ends of the bosses being relieveed all along the length of the skirt, said piston being provided with a vertical, or substantially vertical, slot eextending, from near the junction of the skirt with the head, thruout, or substantially thruout, the length of the skirt to or near the lower end of the skirt.

10. —In a piston for an internal combustion engine, the combination of a substantially cylindrical piston head having grooves therein, piston rings in said grooves, a skirt for said piston head connected to the same, piston pin bosses in said piston, the portions of the skirt adjacent the outer ends of the bosses being relieved all along the length of the skirt, said piston head being provided with circumferential slots adjacent the junction of the head and the skirt, and with a vertical, or substantially vertical, slot, substantially midway between the ends of the piston pin bosses joining one of the horizontal slots at one end and extending thruout, or substantially thruout, the length of the skirt to or near the lower end of the skirt.

11. —In a piston for an internal combustion engine, the coambination of a substantially cylindrical piston head having grooves therein, piston rings in said grooves, a skirt for said piston head connected to the same, piston pin bosses in said piston, portions of the skirt adjacent the outer ends of the bosses being relieveed, said piston beihg provided with cir-

364997—20

cumferential slots adjacent the junction of the head and the skirt, and with a vertical, or substantially vertical, slot substantially midway between the ends of the piston pin bosses, adjoining one of the horizontal slots at one end and extending thruout, or substantially thruout, the length of the skirt to or near the lower end of the skirt.

It is believed that the new claims herewith presented are clearly allowable and early and favorable action is solicited.

Respectfully submitted,

FRANK JARDINE,
By B. D. WATTS,
His Attorney.

—3— 364997—21

SUPPLEMENTAL OATH

STATE OF OHIO,
CUYAHOGA COUNTY, ss.

Frank Jardine, whose application for Letters Patent for an improvement in PISTONS, serial No. 364,997, was filed in the United States Patent Office on or about March 11th 1920, being duly sworn deposes and says that the subject matter of the foregoing amendment attached hereto and containing new claims 8, 9, 10, 11, ~~12~~ was part of his invention, was invented before he filed his original application above identified for such invention, was not known or used before his invention, was not patented or described in a printed publication in any country more than two years before his application, was not patented in a foreign country on an application filed by himself or his legal representatives or assigns more than twelve months before his application, was not in public use or on sale in this country for more than two years before the date of his application, and has not been abandoned.

FRANK JARDINE.

Sworn to before me and signed in my presence this 28th day of Feb. 1921.

MERLE B. PRICE,
Notary Public.

364997—22

(Patent Office Apr 9 1921 Mailed)

2—260

Div. 12 Room 322 Paper No. 7

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

Ch-D

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington Apr. 9, 1921.

B. D. Watts,
451 Lennox Bldg.,
East 9th St. & Euclid Ave.,
Cleveland, Ohio.

Please find below a communication from the Examiner in charge of the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898 PISTONS.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Responsive to the amendment of Mar. 8, 1921.

Claim 9, line 6 "relieves" should be *relieved*. Line 8 "ectending" should be *extending*.

Claim 11, line 2 "combination" is misspelled. Line 6 "relieves" should be *relieved*.

Claims 8 to 11 inclusive are rejected as defining structure unwarranted by the specification and drawing. The slot 12 is described in the specification and shown on the drawing as being spiral or diagonal. It would therefore be inconsistent to claim a "vertical" slot. Applicant is also unwarranted in claiming horizontal slots extending *"substantially thruout"* the length of the skirt when he only shows a slot extending *thruout*.

The expressions "throughout, or substantially throughout," "vertical or substantially vertical" and

"the length of the skirt to or near the lower end—" are objectionable as being alternative.

The remaining claims stand allowed.

P. P. PIERCE,
Examiner.

V.I.C.

364997—23

I 895

(Mail Room Jan 29 1922 U. S. Patent Office)

Division 12, **Paper No. 8**
Jan 24 1922
U. S. Patent Office

B Sup. Oath **12**

In Re Application of
Frank Jardine,
PISTONS

Serial No. 364,997 **Renewal No. 450,898**
Filed March 11th, 1920.
Allowed September 8th, 1920.
Renewed.

Cleveland, Ohio.
January 20, 1922.

Hon. Commissioner of Patents,
Washington,
D. C.

Sir:—

B

Applicant amends the above identified application as follows:—

Page 1, line six from the bottom, cancel "slipper type".

Page 2, line 3, cancel "slipper type".

Page 2, lines 9 and 10, cancel "is of the so-called slipper type and". Page 2, line 11, between "guide" and "portion" insert *or skirt*.

Change "slipper" to *guide* in the following places:—

Page 2, line 22; page 3, line 21; page 3, line 24; page 3, line 25; page 3, last line.

Page 2, last line, change "slipper" to *portion*.

Page 3, line 4, change "slipper" to *portion 10a*. Page 3, line 5, change "slipper" to *portion 10*. Page 3, line 5, from the bottom, change "slippers" to *guide portions*.

Page 5, line 11, change "slippers" to *portions*.

Cancel claims 8 to 11 inclusive and substitute the following:—

~~3c.~~ ~~8.~~ 1. In a piston for an internal combustion
B^1 engine, the combination of a head having ring grooves therein, a plurality of webs integral with said head and having diametrically opposite piston pin bosses therein, a skirt integral with said webs relieved adjacent said webs and separated from the head by cir-

364997—24

I 896

cumferential slots and provided with a longitudinal slot connecting the lower end of the piston with one of the circumferential slots. (over)

~~9.~~ 4c In a piston for an internal combustion engine the combination of a head having ring grooves therein, a plurality of cordal webs integral with said head
Per H and having diametrically opposite piston pin bosses therein, a skirt integral with said webs, relieved adjacent said webs and separated from the head by circumferential slots and provided with a
Per G longitudinal slot ~~connecting~~ lying on a line extending from the lower end of the piston ~~with~~ to one of the circumferential slots.

~~10.~~ 5c In a piston for an internal combustion engine, the combination of a head having ring grooves therein, a plurality of webs integral with the head and extending downwardly therefrom, diametrically opposite piston pin bosses in said webs, a skirt for said piston,
Per G relieved adjacent said webs to expose said bosses, with circumferential slots between said head and skirt, and having a longitudinal slot
" G lying on a line extending from connecting the lower end of the skirt with one of the slots.

11. In a piston for an internal combustion engine the combination of a head having ring grooves therein, a plurality of webs connected to the piston head
Per C and extending downward therefrom, diametrically oppositely disposed wrist pin bosses, one in each of said webs, a skirt for said piston connected to the side edges of the webs and relieved adjacent the webs to expose the webs and the bosses, said piston pro-

vided with circumferential slots between the skirt and head and with a longitudinal slot extending from a circumferential slot to the open end of the skirt.

12. In a piston for an internal combustion engine, the combination of a head, a plurality of webs each connected integrally at one end with the head and projecting downwardly therefrom, and piston pin bosses in each web, a skirt for said piston connected integrally with the

I 897

side edges of the webs and relieved adjacent the webs to expose the webs and the bosses, said piston provided with circumferential slots between the piston head and the piston skirt portion, and with a longitudinal slot extending from the open end of the skirt to one of the circumferential slots.

~~6c 13.~~ 2. In a piston for an internal combustion engine the combination of a head comprising a head disc and a peripheral flange having ring grooves

Per I

therein, a pair of chordal webs, substantially rectangular in shape and located opposite each other in the piston, connected integrally at their upper edges to the peripheral flange of the piston, diametrically opposite wrist pin bosses, one in each of said webs, a skirt for said piston integrally connected to each of the side edges of the webs and cut away so as to expose each of the rectangular webs and the piston pin bosses from the outside of the piston, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston. (C/Cls. 3-12)

~~14.~~ 7c In a piston for an internal combustion engine, the combination of a head provided with **having** ring grooves therein, a pair of webs integral with and dependent from said head and located opposite each other, diametrically oppositely disposed wrist pin bosses, one in each of said webs, a skirt for said piston, in-

Per H

tegrally connected to each of the side edges of the webs, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston.

~~15.~~ 8c In a piston for an internal combustion engine, the combination of a head and a pair of cordal webs sub-

stantially rectangular in shape, located opposite each other in the piston and connected integrally at their upper edges to the piston head, diametrically oppositely disposed wrist pin bosses, one in each of said webs, and

—3— 364997—26

I 898

a skirt for said piston integrally connected to each of the side edges of the webs, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston.

~~16.~~ 9c In a piston for an internal combustion engine, the combination of a head, webs integrally connected to said head and dependent therefrom, oppositely disposed piston pin bosses mounted one in each of said webs and integral therewith, a skirt for said piston integrally connected to each of said webs and extending beyond the same, said piston provided with circumferential slots between the head and skirt and with a longitudinal slot connecting one of said circumferential slots and the open end of the skirt of the piston.

10c ~~17.~~ In a piston for an internal combustion engine, the combination of a head having ring grooves therein, a plurality of cordal webs integrally connected with the piston head and extending downwardly therefrom, oppositely disposed piston pin bosses, integral with said webs and mounted therein, a skirt for said piston longer than said webs and interconnected at the side edges of the webs to each of said webs, said piston being provided with circumferential slots between the head and skirt and with a longitudinal slot connecting one of said circumferential slots with the open end of the skirt.

Insert
~~D~~ G

—4— 364997—27

I 899

REMARKS.

Rather than amend the claims applicant has cancelled claims 8 to 11 inclusive and rewritten the same. Applicant does not agree that the expressions are alternative and does not abandon any of the matter originally claimed in claims 8 to 11 but intends that the now claims

shall cover the piston illustrated in the drawings and all of the mechanical equivalents thereof. A supplemental oath is filed herewith.

Respectfully submitted,

B. D. WATTS,
Attorney for Applicant.

Jan. 20, 1922.

—5— 364997—28

(Mail Room U. S. Patent Office Jan 1922)

SUPPLEMENTAL OATH.

STATE OF OHIO
CUYAHOGA COUNTY } ss.

Frank Jardine, whose application for Letters Patent for an improvement in PISTONS, serial No. 364,997, was filed in the United States Patent Office on or about March 11th, 1920, being duly sworn deposes and says that the subject matter of the foregoing amendment attached hereto and containing new claims 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, was part of his invention, was invented before he filed his original application above identified for such invention, was not known or used before his invention, was not patented or described in a printed publication in any country more than two years before his application, was not patented in a foreign country on an application filed by himself or his legal representatives or assigns more than twelve months before his application, was not in public use or on sale in this country for more than two years before the date of his application, and has not been abandoned.

FRANK JARDINE.

Sworn to before me and signed in my presence this 16th day of January, 1922.

MERLE B. PRICE,
Notary Public.

(Notarial Seal)

364997—29

(Mailed Patent Office Jan 30 1922)
2—260

Div. 12 Room 322 Paper No. 9

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.
Ch-D

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, Jan. 30, 1922

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a communication from the EXAMINER in charge of the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Responsive to the amendment of Jan. 23, 1922.

Claims 1, 2 and 3 are rejected as being unpatentable over Claim 4 in view of

Ricardo, 1,294,833, Feb. 18, 1919 (74-108)

Claims 5, 6 and 7 are rejected as being substantially duplicates of each other. Applicant may select either one of these claims that he desires.

Claims 9 to 17 inclusive are rejected as being unpatentable over claim 8 in view of Ricardo, supra. Applicant's alleged invention involves merely the slitting of the curved guide members or slippers shown by Ricardo. Inasmuch as this feature appears to be the only patentable novelty over the reference, the claims in this case are unnecessarily multiplied and applicant is required to cut the number of claims down in proportion to the pat-

entable subject matter contained in the case. See in re Duncan 276 O. G. 211.

Claims 4 and 8 appear allowable.

P. P. PIERCE,
Examiner.

V. I. C.

364997—30

(Mail Room U. S. Patent Office Feb 6 1922)

Division 12, **Paper No. 10**
Feb 7 1922
U. S. Patent Office.

IN THE UNITED STATES PATENT OFFICE

Applicant	: Frank Jardine.	Div. 12, Ch. 1.
Invention	: Pistons.	Room 322.
Serial No.	: 450,898.	
Filed	: Renewal.	

Cleveland, Ohio.
February 2nd, 1922.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:—

Responsive to Office Action dated January 30th, 1922. Cancel claims 1, 2, 3, 5, 7, 11, and 12, and renumber the remaining claims consecutively.

REMARKS

Applicant has materially reduced the number of claims in the case, and asks that the remaining claims be allowed. These cancellations bring the case well within the practice in this art, as indicated by the patents to Mooers, 1,402,309, Jan. 3, 1922, and Turner, 1,312,879, and 1,312,880, Aug. 12, 1919.

On reconsideration, applicant believes the Examiner will agree that the claims recite combinations of elements, and are not, as the Examiner suggests, merely the piston of the Ricardo patent with the addition of a slot. This follows from the fact that the addition of the slot changes the structure and the resistance to, and the disposal of, the forces within and without the piston when the piston is in use. Pressures operating on the piston, will oper-

ate in different directions and must be met and handled in such a way as to realize the advantages sought for.

364997—31

The Ricardo piston has not been generally adopted commercially, while the claimed pistons are in quite general and successful commercial use. Consequently, the various parts operate in a different manner from the Ricardo piston.

We have carefully considered the decisions of ex parte Duncan and in re Duncan. Duncan's case was an extraordinary one, requiring drastic handling, we are satisfied that neither the Commissioner nor Judge Van Orsvel intended to depart from the well established rule set up in the following cases:

In *Dick v. Underwood*, 246 F. R., 309, Judge Hazel said, at p. 313:—

> "Criticism is made upon the multiplication of claims; but, as they all relate to the same subject-matter and are both broad and specific, they were undoubtedly differently phrased to protect the patentee against any possible prior inventions, an expedient that does not invalidate them. *Parke & Davis & Co. v. H. K. Mulford Co.* (C. C.) 189 Fed. 95, affirmed 196 Fed. 496, 116 C. C. A. 262."

In *Parke v. Mulford*, 189 F. R., 95, Judge Hand said, at p. 102 and 103:—

> "The first of the technical objections is because of the vague character of the claims of the patent and their fraudulent reduplication. I can see no basis whatever for this contention. As I have already said, the claims were not for the active principle, nor for the product of the process. Of course claims for a product not defined as the product of a process must contain in themselves adequate differentia, or they will not be good (*Cochrane v. Baddische Anilin Fabrik*, 111 U. S. 293, 310, 4 Sup. Ct. 455, 28 L. Ed. 433); *but the only valid objection to multiplication of claims is when it appears that the patentee is trying deceitfully to go beyond the fair scope of his invention.* I can see no evidence of that here, and the fact that I have sustained the broader claim is a complete answer to such a position. That Takamine in a number of instances should have added other claims more circumscribed in their scope was natural enough, and *what every prudent solicitor ought to do.*

No one can in advance know how far anticipations will go or how little in the end his patent will cover. There is nothing improper, so far as I can see, in first putting your claims as broadly as in good faith you can, and then, *ex abundanti cautela*, following them successively with narrower claims designed to protect you against possible anticipations of which you are not yet aware. Indeed, the very case upon which the defendant relies (*Matheson v. Campbell*, 78 Fed. 910, 917, 24 C. C. A. 384) shows the necessity of claims as broad as one can honestly support. If

any one of the specified differentia of the claim is missing, the defendant's product does not infringe; if any anticipation includes all the differentia, the claim is bad. To pass between this Scylla and the Charybdis, I think a patentee may fairly be entitled to bend sails upon many yards." (Italicizing ours.)

Indeed, the decision of ex parte *Halverson*, 283 O. G. 182, is a warning that ex parte *Duncan* is not to change the well established practice which has been followed in the Federal cases we have cited.

In addition to the reasoning of the courts in the cited cases, we might add that we have found no record of any patent which has been held invalid because of the multiplicity of claims, though many patents have been assailed on that ground. On the contrary, the number of patents which have failed because of too few claims is legion. The equity spirit, which should prevail in adjudicating the claims on meritorious inventions, dictates that the doubt be resolved in favor of allowing the claims, and not by restricting them, endanger the protection on the invention.

If we were to limit ourselves to claim 8 alone of the group including 8 to 17, and prior art, not now developed, was found to anticipate this claim, that feature of the invention would be defeated, and the inventor would be without protection thereon. Such prior art might not, however, as frequently happens, anticipate the narrower claims such as 9 to 17 inclusive.

It has been our observation that settled doctrines of law, like that established by the Federal authorities which we have cited, are often disturbed by some extraordinary case or some extraordinary view of some particular court, and that much harm is done by an effort to follow the extraordinary case or the extraordinary view, and

that ultimately the law goes back into the established channel. It would be regrettable, if the very useful invention here under consideration, were in any way impaired

by departing from the established law as set forth in the Federal decisions which we have cited.

As a matter of precaution, we say that the cancellation of claims made in this amendment, has not been made with the purpose of abandoning the subject matter thereof, but, merely to meet the Examiner's requirement with regard to the number of claims, and because the remaining claims cover the substance of those cancelled.

An allowance is requested.

Respectfully,

B. D. WATTS,

Attorney for Applicant.

BDW:F

364997—34

(Patent Office May 6 1922 Mailed)

2—260

Div. 12 Room 322 **Paper No. 11**

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington May 6, 1922

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a communication from the EXAMINER in charge of the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Responsive to the amendment of Feb. 6, 1922.

Claim 4, 5, 7, 8, 9 and 10 are rejected as being unpatentable over claim 3 in view of Ricardo, of record. The remarks submitted by applicant on Feb. 6, 1922 and the decisions therein cited have been carefully noted but it is not thought that they are in point with the question at issue. The Examiner does not contend that a patent would be rendered invalid by reason of the fact that the claims therein have been unduly multiplied or even that they were duplicates of each other. It is thought that applicant should point out the patentable difference between the several claims. At the present time the Examiner is unable to discover any such patentable difference between the same.

The remaining claims are allowed.

P. P. PIERCE,
Examiner.

V. I. C.

364997—35

(Application Room Jun 15 1922 U. S. Patent Office)
Division 12, Paper No. 12
Jun 16 1922
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

In the application of
Frank Jardine,
For Pistons
Serial No. 450,898,
Filed March 9, 1921.

Cleveland, Ohio, ~~May~~ June 14 1922.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

Applicant responds as follows to the official action dated May 6, 1922.

It is noted that claims 1, 2, 3 and 6 have been allowed, but that claims 4, 5, 7, 8, 9 and 10 are rejected as unpatentable over allowed claim 3 in view of Ricardo.

It is further noted that the examiner thinks the claims should be patentably different and that such difference between the various claims should be pointed out.

Applicant believes that it is not the rule to require that the various claims in a case should be patentably dif-

ferent from each other in the sense that claims in different applications are required to be distinguished. Where the claims in one application must set forth a structure patentable over structure allowable in another case, the claims in a single application need not be so clearly distinguished. If another rule is followed it would be impossible to obtain broad and narrow claims of the same structure in a single application, as this has been repeatedly held to be not only permissible but essential in proper soliciting of patents. (See two cases cited in applicants amendment dated February 6, 1922 in this application.)

Although it has been held by the courts that every claim of a patent is to be considered as setting forth a complete and independent invention, this practice has not been followed to the extent which the language might lead one to expect, since it has been repeatedly held that if two or more claims appear to be alike they will, if practicable, be held to differ rather than to agree. (See Walker on patents 5th Addition page 226, paragraph 177.)

This practice was followed in each of the cases quoted from in applicant's last action where broad and narrow claims which differ in phrasing were held to be valid.

Furthermore, applicants contention that claims in an application need not differentiate patentably over each other is sustained by the case of *Wm. B. Scaife & Sons Co v. Falls City Woolen Mills.* (Circuit Court of Appeals, 209 F. R. 210, November 4, 1913.) The pertinent part of this Circuit Court decision is as follows, the italics being ours.

> This patent is one having a series of twelve claims. It is sometimes said that in such case each claim should be considered as a separate patent. This statement, accurate enough for some purposes, is misleading, if followed too far; but we must at least say that, usually, proper construction and effect can be given to each claim only by differentiating it from the other claims. *Each claim should be capable of such differentiation else it has no right to exist*; and the difficulty often found in doing so, caused by repetition and confusion, does not effect the propriety of this rule of construction in a normal case where it can be clearly applied. *Each claim*

should be directed at some function, step, or advantage to give it individuality; it should have a characterizing thought of point by which it can be identified; and, of the court which is to construe the claim can find this dominant thought, its task will be simplified.

Assuming the rule to be as set forth by applicant, the distinctions between the various claims will now be pointed out. Claims 4, 8 and 10 belong to the same general group, involving chordal webs differently defined in the various claims, each claim being distinguished from claim 3 by limitations to the specific kind of webs, namely, chordal webs as contrasted with other types of webs

which was described by the broader wording of claim 3.

Similarly claims 5, 7 and 9 belong to a single group where each of the claims is distinguished from the others by certain limitations. For example, claim 5 sets forth a skirt relieved adjacent the webs, claim 7 sets forth a pair of webs with a skirt connected to the side edges of the webs, and claim 9 sets forth the skirt extending beyond the webs. In addition to being thus different from one another the claims are distinguished from claim 3 among other things in these particulars above mentioned.

It has been our personal experience that patents are often held invalid because of having too few claims, but that multiplicity of claims has never been the cause of a patent being held invalid. If a court should decide there are too many claims it may declare certain ones thereof invalid without invalidating the whole patent. Furthermore, if a patent is granted with a limited number of claims it may and in fact often does happen that a meritorious invention is lost to the inventor through non-infringement of anyone of the claims granted, whereas if additional claims stating the invention is slightly different terms, has been issued the competing structure would have been technically, as it was actually, an infringement. By insisting on the claims in this case applicants attorney is inspired ~~in~~ by the belief that both the examiner and himself are working to the common end of issuing patents covering the invention in a manner to assure to the inventor the full benefit of his invention.

The accomplishing of anything less than this injustly deprives the inventor of what was rightfully his and reflects on the workmanship of both the attorney and examiner.

It is believed that the claims now in the case are allowable, and for the many reasons heretofore cited

should be granted. An early allowance is earnestly requested.

Respectfully submitted,

B. D. WATTS.

364997—39

(Mail Room Jul 21 1922 U. S. Patent Office)

Division 12, **Paper No. 13**
Jul 22 1922
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

In the application of
Frank Jardine,
For PISTONS,
Serial No. 450,898
Filed March 9, 1921.

Cleveland, Ohio, July 19, 1922.

Hon. Commissioner of Patents,
D Washington, D. C.

Sir:

Enter the following claim as claim 11.

11. In a piston for an internal combustion engine, the combination of a piston head having a depending ring flange, two pairs of curved guide members oppositely disposed with relation to the axis of the piston, the curved members of each pair thereof being
D¹ separated from the ring flange and from each
Per G other by continuous air gaps, wrist pin bosses and webs connecting the wrist pin bosses with certain of said guide members, said guide members piston head and webs being united in an integral unitary structure.

Insert
E¹

REMARKS.

Claim 11 presented herewith resembles allowed claim 1, closely, and it is believed to be allowable. An early allowance is requested.

Respectfully,

B. D. WATTS.
364997—40

(Patent Office Oct 5 1922 Mailed)
2—260

Div. 12 Room 322 **Paper No. 14**

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington Oct. 5, 1922

B. D. Watts,
451 Lennox Bldg.,
East 9th St. & Euclid Ave.,
Cleveland, Ohio.

Please find below a communication from the Examiner in charge of the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Amended July 21, 1922.

Claims 1, 2, 3, 6 and 11 are allowed.

Claims 4, 5, 7, 8, 9 and 10 are again rejected upon the references and for the reasons given in the last office action.

Referring to applicant's remarks submitted June 15, 1922, it is thought that the arguments and authorities

therein set forth are not in point with the issue now being discussed relative to the case at bar. The Examiner has never contended that the various claims in a case should be patentably different from each other in the sense that claims in different applications are required to be different. But, the Examiner does maintain, that where a claim clearly and completely sets forth the applicant's contribution to the art to which his invention appertains, no good reason is seen, and none has been advanced for allowing a large number of claims, which not only do not include anything new and patentable in addition to the novel feature, already covered, but do not even describe the novel and patentable feature itself in slightly different terms. In the present case applicant is attempting to add old and unpatentable features to his invention for which he has already been

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450,898—2

granted protection by the allowed claims.

If the rejected claims are allowable they are so not because they include "cordal webs" (as against "webs" set forth in claim 3), or because the "webs" extend downwardly from the head, (whereas claim 3 only states that the webs are "integral with the head"), or because the skirt is "integrally connected to each of the side edges of the webs," or because the "webs are substantially rectangular in shape" or because the "skirt extends beyond the webs."

Not any of the above structural limitations, taken singly or in the aggregate, which characterize the chief difference between the allowed and rejected claims, are patentable over Ricardo, of record. For, it is to be noted that Ricardo shows a piston whose head and skirt are separated from each other by circumferential slots, a plurality or a pair of cordal webs integrally with and extending downwardly from the head, said webs being in parallel relation to each other, and having opposed wrist pin bosses, said webs being rectangular in shape and having joined thereto at their side edges the skirt of the piston which skirt extends below the said webs. Applicant's only contribution to the art, as developed by Ricardo, is the splitting of the guide sections or slippers. For this he has ample protection in the allowed claims.

As heretofore stated, it is thought to be well settled in the law that a claim to be properly allowable must define something novel and patenta[illegible] over what forms the

basis for patentability in the allowed claims. To do otherwise would be to invite controversy and litigation.

The foregoing considerations dispose of the issue in the case and as the Examiner is firmly of the opinion that the rejection of May 6, 1922 was proper, the same

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450,899—3

is made final from which applicant may appeal to the board of Examiners-in-Chief if he so desires.

P. P. PIERCE,

V.I.C. *Examiner, Div. 12.*

364997—43

(Patent Office Apr 5 1923 Mailed)

2—260

Div. 12 Room 322 **Paper No. 15**

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

Ch-D

Copy sent applicant and assignee.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

Washington, April 5, 1923.

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a communication from the Examiner in charge of the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,899 Pistons.

THOMAS E. ROBERTSON,

Commissioner of Patents.

The following claims are suggested to the applicant for the purpose of interference:

—A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.

A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction and the skirt portion being cut away adjacent the outer ends of the piston bosses.

A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

364997—44

450,898—2

A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut

through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being co-operably connected at their opposite ends to said cylinder engaging portion.

A piston for internal combustion engines comprising a head having downwardly extending resilient arms carrying curved guide members, said head being of less diameter than the diameter of the guide members.

In a piston of the class described, a cup-like head comprising a pressure receiving end and a wall portion, a skirt circumferentially disconnected from the wall portion of the head and divided from end to end, and skirt carriers connecting said skirt to the pressure receiving end, said skirt carriers being disconnected from the wall portion of the head and susceptible of being slightly flexed radially.

A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

A piston having a head and a cross-head structure connected thereto and comprising diametrically opposite slippers, wrist pin bosses between the slippers and means joining said bosses and slippers together, the said joining means being resiliently yieldable.

A piston comprising a head, a skirt having resilient sections separated from said head by a slit extending continuously around the piston, and means for yieldingly connecting said skirt sections with said head.

Failure to make the above claims within thirty days from the date of mailing of this letter will be taken as a disclaimer of the subject matter covered thereby.

R. M. WEAVER,

Acting Examiner, Div. 12.

V.I.C.

364997—45

(Mail Room May 3 1923 U. S. Patent Office)

Division 12, **Paper No. 16**
May 4 1923
U. S. Patent Office

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Applicant Frank Jardine
Invention Pistons
Serial No. 450,898
Filed March 9, 1921

E Cleveland, Ohio, April 30th, 1923.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:—

In response to the Official Action dated April 5, 1923 in which certain claims were suggested to applicant for purpose of interference, applicant amends as follows:

Insert the following claims as Claims 11 to 21 inclusive.

E' ~~11.~~ **12E** A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.

Per G ~~12.~~ **13E** A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

~~13.~~ **14E** A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to

the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction and the skirt portion being cut away adjacent the outer ends of the piston bosses.

~~14.~~ **15E** A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

~~15.~~ **16E** A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

~~16.~~ **17E** A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion **and** separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being co-operably connected at their opposite ends to said cylinder engaging portion.

~~17.~~ **18E** A piston for internal combustion engines comprising a head having downwardly extending resilient arms carrying curved guide members, said head being of less diameter than the diameter of the guide members.

~~18.~~ **19E** In a piston of the class described, a cup-like head comprising a pressure receiving end and a wall portion, a skirt, circumferentially disconnected from the wall portion of the head and divided from end to end, and skirt carriers connecting said skirt to the pressure receiving end, said skirt carriers being disconnected from the wall portion of the head and susceptible of being slightly flexed radially.

~~19.~~ **20E** A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

~~20.~~ **21E** A piston having a head and a cross-head structure connected thereto and comprising diametrically opposite slippers, wrist pin bosses between the slippers and means joining said bosses and slippers together, the said joining means being resiliently yieldable.

~~21.~~ **22E** A piston comprising a head, a skirt having resilient sections separated from said head by a slit extending continuously around the piston, and means for yieldingly connecting said skirt sections with said head.

REMARKS.

Kindly note a change of address of applicant's attorney from 451 Lennox Building, East 9th and Euclid

Avenue to 1213 Ulmer Building, both in Cleveland, Ohio.

B. D. WATTS,
Attorney for Applicant.

INTERFERENCE.

"A" (1)
Paper No. 17

Interference No. 49569
Name, Frank Jardine,
Serial No. 450,898
Title, PISTONS
Filed, Mar. 9, 1921
Interference with R. E. Day; G. A. Taylor, H. E. Maynard; S. D. Hartog; E. C. Long and E. J. Gulick.

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, Adverse	Dated, June 2/24
Board,	Dated,
Commissioner,	Dated,

REMARKS:

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.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner

364997—50

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences. June 15, 1923 Ch-D

Paper No. 18
[Interference.]
"A" (1)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee.

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49569

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston for internal combustion engine comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for PISTONS, filed by George A. Taylor, of 164 Dana Avenue, Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland and Dike, of Tremont Bldg., Boston, Mass.,

An application for PISTONS, filed by Howard E. Maynard, of 700 Calvert Avenue, Detroit, Michigan, whose

attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Michigan,

An application for PISTONS, filed by Stephen D. Hartog, of 3219 Natural Bridge Avenue, St. Louis, Mo., whose attorney is Rippey and Kingsland, of The Rialto Bldg., St. Louis, Mo.,

An application for INTERNAL COMBUSTION ENGINE PISTONS filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, whose attorney is Herbert G. Fletcher, of 321 International Life Bldg., c/o Knight Bros., St. Louis, Missouri, and

An application for PISTONS, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, of c/o Packard Motor Car Company, Detroit, Michigan, and whose assignee is the Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Hartog	Jardine	Long	Maynard	Taylor
1	14	15	30	15	10	12	13.

adverse

P. P. PIERCE,
Examiner, Div. 12.

V. I. C.

364997—52

"B" (2)

INTERFERENCE.

Interference No. 49570 **Paper No. 19**
Name, Frank Jardine
Serial No. 450,898
Title, PISTONS
Filed, Mar. 9, 1921.
Interference with R. E. Day; G. A. Taylor; E. C. Long; H. E. Maynard; S. D Hartog and E J. Gulick

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, **Adverse**	Dated, **Apr. 8/24**
Board,	Dated,
Commissioner,	Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—53

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 20
[INTERFERENCE.]
"B" (2)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee
B. D. Watts,
451 Lennox Bldg., East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS, Renewal of application filed March 11, 1920 Ser. No. 364,997.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49570

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug 27 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Illinois,

An application for PISTONS, filed by George A. Taylor, 164 Dana Ave., Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for PISTON FOR AN INTERNAL COMBUSTION MOTOR, filed by Elmer C. Long, of 4834 Beaubien St., Detroit, Michigan, whose attorney is Herbert G. Fletcher, of 1111 International Life Bldg., St. Louis, Mo.,

364997—54

450,898—2

An application for PISTONS, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Michigan, whose attorney is Whittemore, Hulbert, & Whittemore, of Penobscot Bldg., Detroit, Mich.,

An application for PISTONS, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Mo., whose attorney is Rippey & Kingsland, of The Rialto Bldg., St. Louis, Mo., and

An application for PISTONS, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, of c/o Packard Motor Car Company, Detroit, Michigan, and whose assignee is the Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Hartog	Gulick	Jardine	Long	Maynard	Taylor
1	15	1	30	16	13	13	14.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

364997—55

2—079

INTERFERENCE.

"C" (3)
Paper No. 21

Interference No. 49571
Name, Frank Jardine,
Serial No. 450,898
Title, PISTONS
Filed, Mar. 9, 1921
Interference with R. E. Day; G. A. Taylor; A. Spillman; H. E. Maynard; E. C. Long; E. J. Gulick (Kelm added)

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, **Adverse**	Dated, **June 2/24**
Board,	Dated,
Commissioner,	Dated,

REMARKS:

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.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—56

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.

June 15, 1923
Ch-D

Paper No. 22
[INTERFERENCE.]

"C" (3)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee.

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS **renewal of application filed March 11, 1920, Ser. No. 364,997.**

Very respectfully,
THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49571

The case, above referred to, is adjudged to interfere with others, hereinafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion and separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being cooperably connected at their opposite ends to said cylinder engaging portion.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for PISTONS, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland and Dike, of Tremont Bldg., Boston, Mass.,

An application for ENGINE PISTONS, filed by Albert Spillman, of 261 Payne Ave., North Tonawanda, N. Y.,

364997—57

450,898—2

whose attorney is Geyer & Popp, of 619 Brisbane Bldg., Buffalo, N. Y.,

An application for PISTONS, filed by Howard E. Maynard, of 700 Calvert Avenue, Detroit, Michigan, whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Michigan,

An application for PISTON filed by Elmer C. Long, of 1037 Main Street, Quincy, Illinois, whose attorney is Herbert G. Fletcher, of International Life Bldg., St. Louis, Mo., and

An application for PISTONS, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Ind., whose attorney is Milton Tibbetts, of c/o Packard Motor Car Co., Detroit, Michigan, whose assignee is the Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Jardine	Long	Maynard	Spillman	Taylor
1	16	31	17	1	14	13	15.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

364997—58

2-079

INTERFERENCE.

"D" (4)
Paper No. 23

Interference No. 49572
Name, Frank Jardine,
Serial No. 450,898
Title, PISTONS
Filed, Mar. 9, 1921
Interference with E. J. Gulick; E. C. Long; S. D. Hartog, H. E. Maynard; A. Spillman and G. A. Taylor

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	Adverse	Dated, Apr. 10/24
Board,		Dated,
Commissioner,		Dated,

REMARKS:

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This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—59

(U. S. Patent Office Jul 7 1923 Mailed)

2-213

Forwarded from 12 Div. to Examiner of Interferences.

June 15, 1923

Ch-D

Paper No. 24

[INTERFERENCE.]

"D" (4)

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE,

Washington, D. C.

Copy sent assignee,

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS renewal of application filed March 11, 1920, Ser. No. 364,997.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49572

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges

and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

This interference involves your application above identified and an application for PISTONS, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for ENGINE PISTONS, filed by Albert Spillman, of 261 Payne Ave., North Tonawanda, N. Y., whose attorney is Geyer & Popp, of 619 Brisbane Bldg., Buffalo, New York,

An application for PISTONS, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Michigan, whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Mich.

364997—60

450,898—2

An application for PISTONS, filed by Stephen D. Hartog of 3219 Natural Bridge Ave., St. Louis, Missouri, whose attorney is Rippey & Kingsland, of The Rialto Bldg., St. Louis, Mo.,

An application for PISTONS FOR INTERNAL COMBUSTION MOTORS filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, whose attorney is Herbert G. Fletcher, of c/o Knight Bros., 321 International Life Bldg., St. Louis, Mo., and

An application for PISTONS, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, of c/o Packard Motor Car Company, Detroit, Mich., whose assignee is the Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Gulick	Hartog	Jardine	Long	Maynard	Spillman	Taylor
1	32	24	20	7	15	16	16.

P. P. PIERCE,

Examiner, Div. 12.

V. I. C.

364997—61

2—079

INTERFERENCE.

~~"E"~~ (5)
Paper No. 25

Interference No. 49573
Name, Frank Jardine
Serial No. 450,898
Title, Pistons
Filed, Mar. 9, 1921
Interference with E. J. Gulick; E. C. Long; H. E. Maynard; Stephen D. Hartog and R. E. Day

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, Adverse	Dated, Apr. 10/24
Board,	Dated,
Commissioner,	Dated,

REMARKS:

.....

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This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—62

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences. June 15, 1923

Paper No. 26
[Interference.]
~~"E"~~ (5)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jar-

dine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS, renewal of application filed March 11, 1920, Ser. No. 364,997.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49573

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope of Marquette Bldg., Chicago Ill.,

An application for PISTONS, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Mich., whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Mich.,

An application for PISTONS, filed by Stephen D. Hartog, of 3219 Natural Bridge Avenue, St. Louis, Mo., whose attorney is Rippey & Kingsland, of The Rialto Bldg., St. Louis, Mo.,

364997—63

450,898—2

An application for INTERNAL COMBUSTION ENGINE PISTONS, filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, whose attorney is Herbert G. Fletcher, of 321 International Life Bldg., c/o Knight Bros., St. Louis, Mo., and

An application for PISTONS, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, of c/o Packard Motor Car Company, Detroit, Michigan, and whose assignee is the Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Hartog	Jardine	Long	Maynard
1	10	1	28	12	8	8.

P. P. PIERCE,
Examiner, Div. 12.

V. I. C.

364997—64

2—079

INTERFERENCE. ~~"H"~~ (8)

Interference No. 49576 Paper No. 27
Name, Frank Jardine,
Serial No. 450,898
Title, PISTONS
Filed, Mar. 9, 1921
Interference with E. J. Gulick; H. E. Maynard; E. C. Long; R. E. Day

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, Adverse	Dated, Apr. 10/24
Board,	Dated,
Commissioner,	Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—65

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences
June 15, 1923
Ch-D

Paper No. 28
[INTERFERENCE.]
~~"H."~~ (8)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee.

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, Pistons, **original filed March 11, 1920, Ser. No. 364,997.**

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49576

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug 27 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion

being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction and the skirt portion being cut away adjacent the outer ends of the piston bosses.

This interference involves your application above identified and an application for Pistons, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., and whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Illinois,

An application for Pistons, filed by Elmer C. Long, of 4834 Beaubien St., Detroit, Mich., and whose attorney is Herbert G. Fletcher of International Life Bldg., St. Louis, Mo.,

An application for Pistons, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Michigan, and whose attorney is Whittemore, Hulbert & Whittemore, of Pe-

450,898—2 364997—66

nobscot Bldg., Detroit, Michigan, and

An application for Pistons, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, and whose attorney is Milton Tibbetts, of c/o Packard Motor Car Co., Detroit, Michigan, and whose assignee is the Cleveland Trust Company, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Jardine	Long	Maynard
1	12	12	14	11	10.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C. 364997—67

2—079

INTERFERENCE. "I" (9)

Interference No. 49577 **Paper No. 29**
Name, Frank Jardine,
Serial No. 450,898
Title, Pistons
Filed, Mar. 9, 1921
Interference with E. J. Gulick; E. C. Long; H. E. Maynard & R. E. Day

DECISIONS OF

Primary Examiner,		Dated,	
Ex'r of Interferences,	**Adverse**	Dated,	**Dec. 20, 1923**
Board,		Dated,	
Commissioner,'		Dated,	

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—68

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 30
[INTERFERENCE.]
"I" **(9)**

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, Pistons, original filed Mar. 11, 1920, Ser. No. 364,997.

Very respectfully,
THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322
Address only
The Commissioner of Patents
Washington, D. C.

49577

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug 27 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

This interference involves your application above identified and an application for Pistons, filed by Ray E. Day of 3825 North 24th St., Tacoma, Wash., and whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for Pistons, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Mich., and whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Mich.,

An application for Internal Combustion Engine Pistons, filed by Elmer C. Long, of 1037 Main St., Quincy, Ill., and whose attorney is Herbert G. Fletcher, of 321

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450,898—2

International Life Bldg., c/o Knight Bros., St. Louis, Mo., and

An application for Pistons, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, c/o Packard Motor Car Company, Detroit, Mich., and whose assignee is The Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Jardine	Long	Maynard
1	11	11	13	9	9.

P. P. Pierce,

V.I.C. *Examiner, Div. 12.*

364997—70

2—079

INTERFERENCE. "J" (10)

Interference No. 49578 Paper No. 31
Name, Frank Jardine,
Serial No. 450,898
Title, Pistons
Filed, Mar. 9, 1921
Interference with E. C. Long; S. D. Hartog; A. Spillman; R. E. Day

DECISIONS OF

~~Primary~~ Law Examiner, Interference dissolved	Dated,	Apr 4 1924
Ex'r of Interferences, Adverse	Dated,	Dec 30/25.
Board, "	Dated,	Nov. 10/24
Commissioner, Affirmed	Dated,	Oct 26 1927
Court "	"	Jany 13/30

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—71

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences. June 15, 1923.

Paper No. 32
[INTERFERENCE.]
"J" (10)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jar-

dine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS, original filed Mar. 11, 1920, Ser. No. 364,997.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322
Address only
The Commissioner of Patents
Washington, D. C.

49578

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. In a piston of the class described, a cup-like head comprising a pressure receiving end and a wall portion, a skirt circumferentially disconnected from the wall portion of the head and divided from end to end and skirt carriers connecting said skirt to the pressure receiving end, said skirt carriers being disconnected from the wall portion of the head and susceptible of being slightly flexed radially.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., and whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for ENGINE PISTONS, filed by Albert Spillman, of 261 Payne Ave., North Tonawanda, N. Y., whose attorney is Geyer & Popp, of 619 Brisbane Bldg., Buffalo, N. Y.,

An application for PISTONS, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Mo., and whose attorney is Rippey & Kingsland, of The Rialto Bldg., St. Louis, Mo., and

450,898—2

An application for INTERNAL COMBUSTION ENGINE PISTONS, filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, and whose attorney is Herbert G. Fletcher, of 321 International Life Bldg., c/o Knight Bros., St. Louis, Mo.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Spillman	Hartog	Jardine	Long
1	17	15	10	19	12.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

364997—73

2—079

INTERFERENCE.

"K" (11)
Paper No. 33

Interference No. 49579
Name, Frank Jardine
Serial No. 450,898
Title, PISTONS
Filed, Mar. 9, 1921
Interference with E. C. Long; S. D. Hartog; A. Spillman.

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, Adverse	Dated, Sept. 3/24
Board,	Dated,
Commissioner,	Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—74

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences. June 15, 1923 Ch-D

Paper No. 34
[INTERFERENCE.]
"K"

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee.

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898; PISTONS, renewal of appln. filed March 11/28, No. 364,997.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49579

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston for internal combustion engines comprising a head having downwardly extending resilient arms carrying curved guide members, said head being of less diameter than the diameter of the guide members.

This interference involves your application above identified and an application for ENGINE PISTONS, filed by Albert Spillman, of 261 Payne Ave., North Tonawanda, New York, and whose attorney is Geyer & Popp, of 619 Brisbane Bldg., Buffalo, N. Y.,

An application for PISTONS, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Mo., and whose attorney is Rippey & Kingsland, of The Rialto Bldg., St. Louis, Mo; and

An application for INTERNAL COMBUSTION ENGINE PISTONS, filed by Elmer C. Long, of 1037 Main St., Quincy, Ill., and whose attorney is Herbert G. Fletcher, of 321 International Life Bldg., c/o Knight Bros., St. Louis, Mo.

364997—75

450898—2

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Hartog	Jardine	Long	Spillman
1	8	18	11	14.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

364997—76

2—079

"M" (13)

INTERFERENCE.

Interference No. 49581 **Paper No. 35**
Name, Frank Jardine,
Serial No. 450,898
Title, Pistons
Filed, Mar. 9, 1921
Interference with Stephen D. Hartog: Elmer C. Long.

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	**Adverse**	Dated, **Apr 8/24**
Board,		Dated,
Commissioner,		Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—77

(U. S. Patent Office Jul 7 1923 Mailed)

2-213

Forwarded from 12 Div. to Examiner of Interferences. June 15, 1923

Paper No. 36
[Interference.]
"M"

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, Filed March 9, 1921, Serial No. 450,898, Pistons.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49581

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug 27, 1923, with the subject of the invention, and name of party filing it, indorsed

on the envelope. The subject-matter involved in the interference is

Count.

1. A piston having a head and a cross-head structure connected thereto and comprising diametrically opposite slippers, wrist pin bosses between the slippers and means joining said bosses and slippers together, the said joining means being resiliently yieldable.

This interference involves your application above identified and an application for Pistons, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Mo., and whose attorney is Rippey & Kingsland, of The Rialto Bldg., St. Louis, Mo., and

An application for Pistons for Internal Combustion Motors, filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, whose attorney is Herbert G. Fletcher, of c/o Knight Bros., 321 International Life Bldg., St. Louis, Mo.,

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Hartog	Jardine	Long
1	7	21	8.

P. P. PIERCE,
Examiner, Div. 12

V.I.C.

364997—78

2—079

INTERFERENCE.

"N" (14)

Interference No. 49582 Paper No. 37
Name, Frank Jardine
Serial No. 450,898
Title, Pistons
Filed, Mar. 9, 1921
Interference with H. E. Maynard: R. E. Day

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	Favorable	Dated, Nov 19/23
Board,		Dated,
Commissioner,		Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—79

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 38
[Interference.]
"N" (14)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee.

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, filed Mar. 9, 1921, Serial No. 450,898, Pistons, original filed Mar. 11, 1920, Ser. No. 364,997.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49582

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. In a piston for an internal combustion engine, the combination of a head having ring grooves therein, a plurality of webs integral with said head and having diametrically opposite piston pin bosses therein, a skirt integral with said webs relieved adjacent said webs and separated from the head by circumferential slots and provided with a longitudinal slot connecting the lower end of the piston with one of the circumferential slots.

This interference involves your application above identified and an application for Pistons, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., and whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill., and

An application for Pistons, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Mich., and whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Mich.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Jardine	Maynard
1	19	3	17

P. P. PIERCE,
Examiner, Div. 12.

V. I. C.

364997—80

2—079

INTERFERENCE.

"O" (15)

Interference No. 49583 Paper No. 39
Name, Frank Jardine
Serial No. 450,898
Title, Pistons
Filed, Mar. 9, 1921
Interference with S. D. Hartog; Albert Spillman.

DECISIONS OF —

Primary Examiner,	Dated,
Ex'r of Interferences,	Dated,
Board,	Dated,
Commissioner,	Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—81

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences. June 15, 1923 Ch-D

Paper No. 40
[Interference.]
"Q" (15)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Copy sent assignee.

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898—Pistons, original filed Mar. 11, 1920, Ser. No. 364,997.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49583

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed

on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head, a skirt having resilient sections separated from said head by a slit extending continuously around the piston, and means for yieldingly connecting said skirt sections with said head.

This interference involves your application above identified and an application for Engine Pistons, filed by Albert Spillman, of 261 Payne Ave., North Tonawanda, N. Y., and whose attorney is Geyer & Popp, of 619 Brisbane Bldg., Buffalo, N. Y., and

An application for Pistons, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Mo., and whose attorney is Rippey & Kingsland, of The Rialto Bldg., St. Louis, Mo.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Hartog	Jardine	Spillman
1	34	22	1.

P. P. PIERCE,
Examiner, Div. 12.

V. I. C.

364997—82

2—079

INTERFERENCE.

"U" (21)

Interference No. 49589 Paper No. 41
Name, Frank Jardine
Serial No. 459,898
Title, Pistons
Filed, Mar. 9, 1921
Interference with Howard E. Maynard

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, Favorable	Dated, Nov 19/23
Board,	Dated,
Commissioner,	Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—83

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences June 15, 1923 Ch-D

Paper No. 42
[INTERFERENCE.]
"U"

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

B. D. Watts,
451 Lennox Bldg., East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS, renewal of appln. filed March 11, 1920, No. 364,997.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49589

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. In a piston for an internal combustion engine the combination of a head comprising a head disc and a peripheral flange having ring grooves therein, a pair of cordal webs, substantially rectangular in shape and located opposite each other in the piston, connected integrally at their upper edges to the peripheral flange of the piston, diametrically opposite wrist pin bosses, one in each of said webs, a skirt for said piston integrally connected to each of the side edges of the webs and cut away so as to expose each of the rectangular webs and the piston pin bosses from the outside of the piston, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston.

This interference involves your application above identified and an application for PISTONS, filed by Howard E. Maynard, of 700 Calvert Ave., Detroit, Michigan, and whose attorney is Whittemore, Hulbert & Whittemore, of Penobscot Bldg., Detroit, Michigan.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Jardine	Maynard
1	6	18.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C. 364997—84

2—079

INTERFERENCE.

"V" 22
Paper No. 43

Interference No. 49590
Name, Frank Jardine,
Serial No. 450,898
Title, PISTONS
Filed, Mar. 9, 1921
Interference with Elmer C. Long

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, **Adverse**	Dated, **Apr. 8/24**
Board,	Dated,
Commissioner,	Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

364997—85

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 44
[INTERFERENCE.]
"V"

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

B. D. Watts,
451 Lennox Bldg.,
East 9th & Euclid Ave.,
Cleveland, Ohio.

Please find below a copy of a communication from the Examiner concerning the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS, renewal of appln. filed March 11/20 No. 364,997.

Very respectfully,
THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322
Address only
The Commissioner of Patents
Washington, D. C.

49590

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Counts.

1. In a piston for an internal combustion engine, the combination of a piston head having a depending ring flange, two pairs of curved guide members oppositely disposed with relation to the axis of the piston, the curved members of each pair thereof being separated from the ring flange and from each other by continuous air gaps, and webs carrying wrist pin bosses, the said curved members, piston head and webs being united in an integral unitary structure.

2. In a piston for an internal combustion engine, the combination of a piston head having a depending ring flange, two pairs of curved guide members oppositely disposed with relation to the axis of the piston, the curved members of each pair thereof being separated from the ring flange and from each other by continuous air gaps, wrist pin bosses and webs connecting the wrist pin bosses with certain of said guide members, said guide members piston head and webs being united in an integral unitary structure.

This interference involves your application above identified and an application for PISTONS FOR INTERNAL COMBUSTION MOTORS, filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, and whose attorney is Herbert G. Fletcher, of c/o Knight Bros., 321 International Life Bldg., St. Louis, Missouri.

364997—86

450,898—2

The relation of the counts of the interference to the claims of the respective parties is as follows:

Counts	Jardine	Long
1	1	9
2	11	10

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

364997—87

(U. S. Patent Office Dec 3 1923 Mailed)

2—260

Div. 12 Room 322 Paper No. 45

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

Ch-D All communications respecting this application should give the serial number date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington

Richey, Slough and Watts,
1213 Ulmer Building,
Cleveland, Ohio.

Please find below a communication from the Examiner in charge of the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, PISTONS. Originally filed Mar. 11, 1920, Serial No. 364,997.

THOMAS E. ROBERTSON,
Commissioner of Patents.

49571

In accordance with the provisions of Rule 129, the application for patent filed by Gustave R. Kelm, whose post-office address is c/o Walker M. Levett Company, 417 East 23rd St., New York, New York, whose attorney is Clarence D. Kerr, of No. 5 Nassau Street, New York, New York, and whose assignee is the Walker M. Levett Company, of New York, New York, a corporation of New York, is hereby added to Interference No. 49571, between Day v. Taylor v. Spillman v. Maynard v. Jardine v. Long v. Gulick, to which you are a party. The claim of Kelm's application corresponding to the count of the issue is

Count	Claim
1	7.

The new party only is given until the Dec. 31, 1923, day of ....., 19..., within which to file the preliminary statement required by Rule 110.

The issue of the interference remains unchanged.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C. 364997—88

(U. S. Patent Office Dec 3 1923 Mailed)
2—260

Div. 12 Room 322 **Paper No. 45 46**

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.
Ch-D

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington

Richey, Slough and Watts,
1213 Ulmer Building,
Cleveland, Ohio.

Please find below a communication from the EXAMINER in charge of the application of Frank Jardine, Filed Mar. 9, 1921, Serial No. 450,898, Pistons originally filed Mar 11, 1920, Serial No. 364,997.

THOMAS E. ROBERTSON,
Commissioner of Patents.

49572

In accordance with the provisions of Rule 129, the application for patent filed by Gustav R. Kelm, whose post-office address is c/o Walker M. Levett Company, No. 417 East 23rd Street, New York, New York, whose attorney is Clarence D. Kerr, of No. 5 Nassau Street, New

York, N. Y., and whose assignee is the Walker M. Levett Company, of New York, New York, a corporation of New York is hereby added to Interference No. 49572, between Taylor v. Spillman v. Maynard v. Jardine v. Hartog v. Long v. Gulick, to which you are a party. The claim of Kelm's application corresponding to the count of the issue is:

Count	Claim
1	8.

The new party only is given until the Dec 31 1923, day of ....., 19...., within which to file the preliminary statement required by Rule 110.

The issue of the interference remains unchanged.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

364997—89

(U. S. Patent Office Dec 3 1923 Mailed)

2—260

Div. 12 Room 322 Paper No. 47

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

Ch-D

All communications respecting this application should give the serial number date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington

(Copy sent Assignee)

Richey, Slough and Watts,
1213 Ulmer Building,
Cleveland, Ohio.

Please find below a communication from the EXAMINER in charge of the application of Frank Jardine, Filed March 9, 1921, Serial No. 450,898, originally filed March 11, 1920, Serial No. 364,997, Pistons.

THOMAS E. ROBERTSON,
Commissioner of Patents.

49581

In accordance with the provisions of Rule 129, the application for patent filed by Gustav R. Kelm, whose post-office address is c/o Walker M. Levett Company, 417 East 23rd Street, New York, New York, whose attorney is Clarence D. Kerr, No. 5 Nassau Street, New York, New York, and whose assignee is the Walker M. Levett Company, of New York, New York, a corporation of New York, is hereby added to Interference No. 49581 between Jardine v. Hartog v. Long to which you are a party. The claims of Kelm's application corresponding to the count of the issue is:

Count	Claim
1	9.

The new party only is given until the Dec 31 1923 day of ....., 19..., within which to file the preliminary statement required by Rule 110.

The issue of the interference remains unchanged.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

364997—90

(Mail Room Nov 5 1923 U. S. Patent Office)
(Docket Division Nov. 5 1923)

450,898—48
Doc

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Applicant —Frank Jardine
Invention —Pistons
Serial No. —364,997, Renewal No. 450,898
Filed —March 9, 1921
Div 12 —Room 322

Cleveland, O., Nov. 3, 1923.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:—

I hereby substitute in my place as attorneys in the above entitled case, the firm of Richey, Slough & Watts, Register No. 11,730, (a partnership composed of F. O. Richey, F. M. Slough, B. D. Watts and W. M. Hart), 1213 Ulmer Building, Cleveland, Ohio, with all the powers originally delegated to myself.

And I hereby request that this substitution apply to each of the interferences in which the said application is now involved, identified by number as follows:—

No. 49,569	No. 49,577
49,570	49,578
49,571	49,579
49,572	49,581
49,573	49,582
49,576	49,583
	49,589
	49,590

B. D. WATTS,
Attorney of Record.

The foregoing substitution is hereby approved.
ALUMINUM MANUFACTURES, INC.
By W. P. KING,
President.
Assignee of Record

(U. S. I. R. Documentary Stamp 25 Cents.)

364997—91

(Mail Room Nov 12 1925 U. S. Patent Office)
(Docket Division Nov 17 1925 U. S. Patent Office)

Intf. No. 49578 T. B.
Briefs for Jardine Nov. 16/25 **450,898—49**
~~49579 49560 T. B. 49589 dist.~~

IN THE UNITED STATES PATENT OFFICE

Applicant	Frank Jardine
Application	Pistons
Filed	March 9, 1921
Serial No.	450,898
Docket No.	1977

Cleveland, Ohio,
November 10, 1925.

The Commissioner of Patents,
Washington, D. C.

Sir:

I hereby appoint the firm of Richey & Watts, 1983 Union Trust Bldg., Cleveland, Ohio, (composed of F. O.

Richey and B. D. Watts), Register No. 11,730 as substitute attorneys with all of the powers originally given to me, in the above entitled application.

B. D. WATTS,
G. *Attorney of Record.*

(U. S. I. R. Documentary Stamp 25 Cents.)

364997—92

(Mail Division Aug 13 1928 U. S. Patent Office)

9 49583 U. S. Patent Office
18 49578 Aug 14 1928
24 Division 12 **Paper No. 50**
Not ent.

IN THE UNITED STATES PATENT OFFICE

Applicant —Frank Jardine
Application—Pistons
Serial No. —450,898
Filed —March 9, 1921

Cleveland, Ohio,
August 7, 1928.

The Commissioner of Patents,
F Washington, D. C.

Sir:

Applicant hereby amends as follows:

Add the following claim—

A one piece piston comprising a head and a skirt, the skirt having boss carrying portions exteriorly relieved and arranged opposite each other and secured to the head by substantially rigid connectors to
Per H cause radially outward and inward movement of the portions under operation conditions of the piston, the skirt also having opposite bearing wall portions arranged between the said boss carrying portions and each separated from the head by a slot of greater circumferential length than the corresponding length of the said portions.

Respectfully submitted,

FRANK JARDINE,
By RICHEY & WATTS,
His Attorneys.

REMARKS

Applicant makes the above claim which is Count 4 of Interference No. 56,380, Franquist vs. Covert.

—1— 364997—93

The claim is Covert's claim 15 and Franquist's claim 31. Applicant has recently learned that an interference regarding this subject matter existed and has made the claim promptly upon learning of the same.

The claim reads upon the Jardine construction as follows: The head of the piston is shown at 1 and the skirt at 2. The boss-carrying portions are shown at 6 which are relieved about the bosses. The boss-carrying portions are arranged opposite to each other and secured to the head by substantially rigid connectors to which the reference numerals 9 are attached and which cause the outward and inward movement of the skirt portions. The opposite bearing walls of the skirt portions are shown at 10, each of which is separated from the head by slots 11 which extend as is best shown in the upper left-hand corner of Fig. 1 beyond the bearing faces.

Respectfully submitted,

RICHEY & WATTS,
Applicant's Attorneys.

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(Mailed Feb 8 1930)

Div. 12 Room 380 260 CAK:JTE **Paper No. 51**

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, and name of the applicant

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
Washington Feb. 8, 1930.

Please find below a communication from the Examiner in charge of this application.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Applicant: Frank Jardine,
Ser. No. 450,898 (Renewal)
Filed Mar. 9, 1921
For Pistons.

Richey & Watts,
1983 Union Trust Bldg.,
Cleveland, Ohio.

Interferences 49,569; 49,570; 49,571; 49,572; 49,573; 49;576; 49,577; 49,578; 49,579; 49,581; 49,583; and 49,590 having been decided adverse to the applicant, claims 1, and 11 to 22, inclusive, are *finally* rejected in accordance with the provisions of Rule 132.

P. P. PIERCE,
Examiner.

CAK

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I 900

(Chief Clerk May 8 30 U. S. Patent Office)

U. S. Patent Office
May 8 1930
Division 12, Paper No. 52

Applicant —Frank Jardine
Application—Pistons
Serial No. —~~364,997~~ 450,898
Filed —March 9, 1921
Docket No. —1977

Division 12

Cleveland, Ohio, May 7, 1930.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In response to Official Action dated February 8, 1930 applicant amends as follows:

Claim 4, line 7, cancel "connecting" and substitute —*lying on a line extending from*—. Same line cancel "with" and substitute —*to*—.

Claim 5, line 5, after "webs" insert —*to expose said bosses*. Line 7 after "slot" insert —*lying on a line extending from*—.

Cancel Claims 1, and 11 to 22 inclusive.

Add the following claims:

23. 3. An internal combustion engine piston comprising a head having a depending ring flange, webs integrally cast to the ring flange and depressed within the circumference defined by the ring flange, wrist pin bosses cast in the webs, and curved guide means integrally cast to the webs and provided with a longitudinal slit disposed between the ends of the webs on one side of the piston, the outer surface of the guide means being disposed in a circumference outwardly of the outer surface of the webs and merging into the latter at included angles sufficiently great to permit the removal of a permanent mold part used to form the outer surface of the piston.

(over)

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I 901

24. 4 In a piston for an internal combustion engine, the combination of a head having a depending circumferential flange provided with ring grooves on the exterior thereof, chordal webs integral with the head and depending therefrom in opposite positions, piston pin bosses, one located in each web opposite each other, a skirt portion cut away from the head to expose the bosses in the webs and provided with curved bearing faces integral with the webs and connected to the ends of the webs opposite each other, each of said bearing faces being separated from the head except for the integral connection through the webs and one of said bearing faces having a substantially vertical slot therein.

25. 5 In a piston for an internal combustion engine, the combination of a head having a depending circumferential flange provided with ring grooves on the exterior thereof, chordal webs integral with the head and depending therefrom in opposite positions, piston pin bosses one located in each web opposite each other, ribs integral with and substantially perpendicular to the webs joining the webs and the head, a skirt portion cut away from the head to expose the bosses in the webs provided with curved bearing faces integral with the webs and connected to the ends of the webs opposite each other, each of said bearing faces being separated from the head except for the integral connection through the webs and one of said bearing faces having a substantially vertical slot therein.

26. 6. In a piston for an internal combustion engine, the combination of a head having a depending circumferential flange provided with ring grooves on the exterior thereof, chordal webs integral with the head and depending therefrom in opposite positions, piston pin bosses, one located in each web opposite each other, ribs integral with and substantially perpendicular to the webs joining the webs, the bosses and the head together, a skirt portion cut away from the head to expose the bosses in the webs and provided with curved bearing faces integral with the webs and connected to the ends of the webs opposite each other, each of said bearing

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I 902

faces being separated from the head except for the integral connection through the webs and one of said bearing faces having a substantially vertical slot therein.

27. 7 A piston for an internal combustion engine comprising a head portion having a depending ring flange, a skirt portion, said skirt portion comprising a pair of substantially parallel webs carried by the head portion and provided with opposed wrist pin bosses, bearing portions carried by the ends of said webs and separated from the head by air gaps, the laterally outer faces of said web portions being free from laterally overhanging edge portions of the bearing faces, one of said bearing faces being provided with a longitudinal slot disposed intermediate the end portions of said bearing face.

28. 8 In a piston for an internal combustion engine, the combination of a head having a cylindrical ring flange, oppositely disposed webs integral with the flange and carrying diametrically opposite piston pin bosses, a skirt integral with said webs and cut away to expose the sides of said webs and separated from the ring flange by circumferential slits and provided with a longitudinal slit disposed between the ends of the webs.

29. 9 In a piston for an internal combustion engine, the combination of a head comprising a disc and a peripheral flange having ring grooves therein, a pair of cordal webs connected to the flange of the head by outwardly flaring extensions, oppositely disposed wrist pin bosses in the webs, and a cylindrical skirt cut away to expose the webs and integrally connected to the ends of the latter, the skirt being separated from the head

between the said webs by circumferential slits and the skirt having a longitudinally extending slit disposed between the ends of the webs on one side of the piston.

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I 903

~~30.~~ 10 In a piston for an internal combustion engine, the combination of a piston head including a depending ring flange, oppositely disposed webs depending from the ring flange and disposed inwardly thereof, wrist pin bosses in the webs, and curved bearing means integrally connected to the webs and separated from the head by air gaps extending circumferentially of the piston between the ends of the webs, the said bearing means having a slit located between the ends of the webs and extending in a direction lengthwise of the piston.

~~31.~~ 11 In a piston of an internal combustion engine, the combination of a piston head having a cylindrical ring flange depending therefrom, webs integral with the flange extending convergingly inwardly of the piston from the opposite portions of the flange and then lengthwise of the piston in substantially parallel arrangement, wrist pin bosses in the webs, and a skirt joined to the ends of the webs on opposite sides of the bosses and cut away to expose substantially all of the sides of the webs, all the foregoing parts being integrally connected together, there being circumferentially extending air gaps separating the head and skirt between the webs and a slot in one side of the skirt between the ends of the webs and extending in a direction lengthwise of the piston.

~~32.~~ 12 In a piston for an internal combustion engine, the combination of a piston head comprising a disc with a depending peripheral ring flange, a skirt separated from the head by circumferentially extending air gaps, cordal webs integrally connected at their end to the skirt with their outer surfaces near the points of connection with the skirt diverging outwardly to merge into the outer surfaces of the skirt, wrist pin bosses integrally formed with the webs, and integral connections between the depending flange of the head and the adjacent ends of the webs, said connections extending from the flange inwardly and lengthwise of the piston and merging into the webs with outwardly diverging sur-

faces, the skirt having a longitudinally extending slit formed on one side thereof between the ends of the webs.

(Sig.)
364997—99
I 904

Respectfully submitted,

FRANK JARDINE,
By RICHEY & WATTS,
His Attorneys.

REMARKS

The claims constituting the issues of the interferences which were decided adversely to applicant have been canceled and new claims drawn specifically to the patentable subject matter of Applicant's device substituted.

Claims 3 and 6 constituted the issue of interferences No. 49582 and 49589, in which priority was awarded to applicant.

Claims 4, 5, 6, 8, 9, and 10 were, before the declaration of the interferences, rejected as not being patentably distinct from claim 3. Accordingly the subject matter of these claims is believed to be allowable along with claim 3.

Claims 4 and 5 have been amended slightly to further distinguish from claim 3, and it is believed that all of these claims may now be allowed.

New claim 23 includes webs cast integrally with the ring flange and also recites the relation of the thrust members and webs which join at included angles sufficiently great to permit removal of a permanent mold part used in casting the piston. These limitations distinguish from the prior art and from the applications involved in the interferences. Claim 24 is believed to be patentable by reason of the recitation of a skirt portion cut away from the head to expose the bosses in combination with the other elements of applicant's structure. Claim 25 includes in addition the vertical ribs 9 above the piston pin bosses joining the webs to the head. Claim 26 defines these ribs more specifically.

364997—100
I 905

Claim 27 is believed to be patentable by reason of the definition of the webs as having lateral outer faces

free from laterally overhanging edge portions of the bearing faces.

Claim 28 is similar to claim 3 but recites in addition that the webs are integral with the ring flange. Claim 29 distinguishes from Claim 6 in the same manner. Each of these claims also defines the longitudinal slit in slightly broader terms than claims 3 and 6.

Claim 30 is drawn along the lines of Claim 11 but distinguishes from the disclosure of the parties involved in the interferences by reciting the webs as depending from the ring flange.

Claims 31 and 32 are drawn more specifically to the structure of applicant's piston which permits its manufacture in permanent molds. Claim 31 states that the webs are integral with the flange and extend convergingly inwardly therefrom and have substantially all of their outer sides exposed. Claim 32 defines the outwardly diverging connections between the webs and the skirt sections and the outwardly diverging connections between the webs and the ring flange.

All of the claims now in the case are believed to be patentably distinct from the prior art and the disclosures of the winning parties in the interferences and are believed to be sufficiently distinguished from each other to warrant their allowance.

Respectfully submitted,

By Richey & Watts.

Applicant's Attorneys.

11CS

364997—101

(Chief Clerk May 8 30 U. S. Patent Office)

U. S. Patent Office
May 8 1930
Division 12, Paper No. 53

Applicant	Frank Jardine	Division 12
Application	Pistons	
	~~450,898~~	
Serial No.	~~364,997~~	
Filed	March 9, 1921	
Docket No.	1977	

Washington, D. C.,
May 8, 1930.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

Kindly amend the above-entitled application as follows:

Cancel claims 2, 4, 5, 7, 8, 9 and 10.

Cancel the claim submitted in the amendment dated August 7, 1928.

Respectfully submitted,
FRANK JARDINE,
By RICHEY & WATTS,
His Attorneys.

REMARKS

At the interview courteously granted this day by the Examiner to applicant's attorney, claims 2, 4, 5, 7, 8, 9 and 10 were discussed in connection with the Office action of Oct. 5, 1922, and in connection with claims 23-32 inclusive, added by the preceding amendment.

The Examiner held claim 2 to be unpatentable over the issue of Interference No. 49590, involving applicant's claim 1. Accordingly, this claim has been cancelled.

Claims 4, 5, 7, 8, 9, and 10 have been cancelled as not being patentably distinct from Claim 3, and also because it is believed the patentable subject-matter thereof is more clearly defined in new claims 23-32, inclusive.

The claim submitted by the amendment dated Aug.

364997—102

7, 1928, which was not entered, has been cancelled in order to clarify the record.

Respectfully submitted,
By RICHEY & WATTS,
Applicant's Attorneys.

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(Mailed May 9 1930)

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Div. 12 Serial No. 450,898
CAK:JTE (Renewal)

Address only
The Commissioner of Patents
Washington, D. C.

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE

Washington May 9, 1930.

Frank Jardine (Assor etc.)

YOUR APPLICATION for a patent for an IMPROVEMENT in PISTONS filed Mar. 9, 1921 has been examined and ALLOWED with 12 claims.

The final fee, TWENTY DOLLARS, WITH $1 ADDITIONAL FOR EACH CLAIM ALLOWED IN EXCESS OF 20, must be paid not later than SIX MONTHS from the date of this present notice of allowance. If the final fee be not paid within that period, the patent will be withheld, but the application may be renewed within one year after the date of the original notice with a renewal fee of $20 and $1 additional for each claim in excess of 20.

The office delivers patents upon the day of their date, on which date their term begins to run. The preparation of the patent for final signing and sealing will require about four weeks, and such work will not be begun until after payment of the necessary final fee.

When the final fee is paid, there should also be sent, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR, TITLE OF THE INVENTION, AND SERIAL NUMBER AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and, if assigned, the NAMES OF THE ASSIGNEES.

If it is desired to have the patent issue to an ASSIGNEE OR ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of the final fee.

After issue of the patent, uncertified copies of the drawings and specifications may be purchased at the price of TEN CENTS EACH. The money should accompany the order. Postage stamps will not be received.

The final fee will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

NOTICE.—WHEN THE NUMBER OF CLAIMS ALLOWED IS IN EXCESS OF 20, NO SUM LESS THAN $20 PLUS $1 ADDITIONAL FOR EACH CLAIM IN EXCESS OF TWENTY CAN BE ACCEPTED AS THE FINAL FEE.

☞ IN REMITTING THE FINAL FEE GIVE THE SERIAL NUMBER AT THE HEAD OF THIS NOTICE.

☞ UNCERTIFIED CHECKS WILL NOT BE ACCEPTED.

Respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Richey & Watts,
1983 Union Trust Bldg.,
Cleveland, Ohio.

NOTICE.

Final Fee effective June 1, 1930.
$25, with $1.00 additional for each claim in excess of 20.

364997—104

($20 Rec'd May 15 30 C. C. U. S. Patent Office J)

FINAL FEE PAID TO THE COMMISSIONER OF PATENTS

(Be careful to give correct Serial No.)

Serial No. 450,898

INVENTOR:
FRANK JARDINE

PATENT TO BE ISSUED TO
As Per Record (Cleveland Trust Co[illegible]y)

NAME OF INVENTION, AS ALLOWED:

DATE OF PAYMENT:
May 15 1930

FEE:
$20.00

DATE OF FILING:
March 9, 1921

DATE OF CIRCULAR OF ALLOWANCE:
May 9, 1930

The Commissioner of Patents will please apply the accompanying fee as indicated above.

RICHEY & WATTS,
Attorney.

SEND PATENT TO

Messrs. Richey and Watts
Union Trust Bldg.,
Cleveland, Ohio.

Final fees will not be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

364997—105

(Mailed May 28 1930)
254

CAK:JTE
Div. 12 Room 380 Paper No. 54

Address only
"The Commissioner of Patents,
Washington, D. C."
and not any official by name

All communications respecting this application should give the serial number, date of filing, and name of the applicant

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
Washington May 28, 1930.

Please find below a communication from the EXAMINER in charge of this application.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Richey & Watts,
1983 Union Trust Bldg.,
Cleveland, Ohio.

Applicant Frank Jardine
Ser. No. 450,898 (Renewal)
Filed Mar. 9, 1921
For Pistons.

In accordance with the provisions of Order No. 2308, dated March 12, 1917, which reads in part as follows:

* * * * * * * * *

Obvious informalities in the application may be corrected by the examiner, but said correction must be in the form of an amendment, approved by the Principal Examiner in writing, placed in the file, and made a part of the record. The changes specified in the amendment will be entered by the clerk in the regular way.

* * * * * * * *

the changes, hereinafter specified, are made by the examiner in the application above identified.

Should these changes not be satisfactory to the applicant, appropriate amendment may be proposed under the provisions of Rule 78, provided the specification has not been printed.

The application has been amended as follows:

I

Claim 2, line 3, "*chordal*" has been substituted for "cordal."

C. C. HENRY,
Examiner.

364997—106

(Mail Room Sep 30 1930 U. S. Patent Office)

#55

UNITED STATES DISTRICT COURT
Northern District of Ohio
(Eastern Division)

HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (41 42 Stat. L....), you are advised that there was filed on the 29th day of September 1930, in this court an action, suit, or proceeding No. 3510 entitled

Name The Cleveland Trust Company
Cleveland, Ohio Plaintiff
Address Chrysler Corporation
Highland Park, Michigan

versus

Name The Simmons Manufacturing Company
3405 Perkins Ave. Cleveland, Ohio Defendant
Address Sterling Products Corporation
2914 North Market St., St. Louis, Missouri

brought upon the following patents:

Patent No.	Date of Patent.	Patentee.
1,092,870	April 14, 1914	Edward O. Spillman and Louis P. Mooers
1,402,309	Jan. 3, 1922	L. P. Mooers
1,153,902	Sept. 21, 1915	Gustave E. Franquist
~~1,473,223~~	~~Nov. 6, 1923~~	H. & H. Machine Company
16,273 Reissue	Feb. 23, 1926	Cleveland Trust Company
1,655,968	Jan. 10, 1928	Chrysler Corporation and Aluminum Co.
1,763,523	June 10, 1930	Cleveland Trust Company
1,256,265	Feb. 12, 1918	Victor E. Schmiedeknecht

Patent No.	Date of Patent.	Patentee.

In the above-entitled case the following decision has been rendered or decree issued:

In Witness Whereof I have affixed my hand this 29th day of Sept., 1930, at Cleveland, Ohio.

~~B. C. Miller,~~
F. J. Denzler,
Clerk of said Court,
By Ruth Strain,
Deputy Clerk.

364997—107

(Mail Room Oct 27 1930 U. S. Patent Office)

#56

UNITED STATES DISTRICT COURT
~~Northern District of Ohio~~
(Eastern Division)

Honorable Commissioner of Patents,
Washington, D. C.

Sir:

In compliance with the Act of February 18, 1922 (~~41~~ 42 Stat. L .....), you are advised that there was filed on the 24 day of October 1930, in this court an action, suit, or proceeding No. 3561 entitled

Name Cleveland Trust Company, The Plaintiff
Address Cleveland, Ohio

versus

Name The Lawrence-Ohio Company Defendant
Address 6529 Euclid Ave., Cleveland, Ohio
D^3

Ray Day Piston Company.
6656 Walton Ave., Detroit, Michigan

brought upon the following patents:

Patent No.	Date of Patent.	Patentee.
1,092,870	April 14, 1914	Edward O. Spillman and Louis P. Mooers
1,153,902	Sept. 21, 1915	Gustave E. Franquist
1,402,309	Jan. 3, 1922	The Cleveland Trust Company
1,763,523	June 10, 1930	The Cleveland Trust Company

In the above-entitled case, on the ..... day of ..... 192.., the following patents have been included by .....(insert amendment, answer, cross bill, or other pleading:

Patent No.	Date of Patent.	Patentee.

In the above-entitled case the following decision has been rendered or decree issued:

In Witness Whereof I have affixed my hand this 25th day of October, 1930, at Cleveland, O.

~~B. C. Miller,~~
F. J. Denzler,
Clerk of said Court,

By Ruth Strain,
Deputy Clerk.

364997—108

(Mail Room Sep 29 1931 U. S. Patent Office)

Notice on Filing of Patent Case #57

DISTRICT COURT OF THE UNITED STATES

NORTHERN DISTRICT OF OHIO

EASTERN DIVISION

Honorable Commissioner of Patents, Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (41 Stat. L....), you are advised that there was filed on the 29th day of September, ~~1931~~ 1930, in this court an action, suit, or proceeding, No. 3510, entitled—

Name The Cleveland Trust Company, Plaintiff
Cleveland, Ohio
Name Chrysler Corporation
Michigan

versus

Name The Simmons Manufacturing Company,
Cleveland, Ohio Defendant
Name Sterling Products Corporation,
St. Louis, Missouri

brought upon the following patents:

F

PATENT NO.	DATE OF PATENT.	PATENTEE.
1,092,870	April 14, 1914	Edward O. Spillman & Louis P. Mooer
1,402,309	Jan. 3, 1922	L. P. Mooers
1,153,902	Sept. 21, 1915	Gustave E. Franquist
1,473,233	Nov. 6, 1923	H. & H. Machine Company
16,273 Reissue	Feb. 23, 1926	Cleveland Trust Company
1,655,968	Jan. 10, 1928	Chrysler Corp. and Aluminum Co.
1,763,523	June 10, 1930	Cleveland Trust Company
1,256,265	Feb. 12, 1918	Victor E. Schmiedeknecht

In the above-entitled case, on the ..... day of ....., 193.., the following patents have been included by .....
(Insert amendment, answer, cross bill, or other pleading)

PATENT NO.	DATE OF PATENT.	PATENTEE.

In the above-entitled case the following decision has been rendered or decree issued: Sept. 25, 1931 Interlocutory Decree filed & ent.; Letters Patent Nos. 1,092,870, 1,153,902, 1,256,265, 1,402,309, Re-16,273, good and valid in law; The Cleveland Trust Co. owner; Letters Patent No. 1,655,968, good and valid in law; The Cleveland Trust Co. and Chrysler Corp. owner; Letters Patent Nos. 1,763,523, 1,815,733 are good and valid in law and pltf, The Cleveland Trust Co. owner; that defendant the Simmons Manufacturing Co. has infringed all of said Letters Patent; Plaintiff to recover of defendant; that cause be referred to Wm. B. Woods, Special Master for accounting; injunction granted; Pltf. to recover of defendant costs Jones Judge

IN WITNESS WHEREOF, I have affixed my hand this 28th day of September, 1931, at Cleveland, Ohio.

~~B. C. Miller,~~
F. J. Denzler,
Clerk.

By W. L. STEVENS,
Deputy Clerk.

364997—109

(Mail Room Dec 16 1931 U. S. Patent Office)
Notice on Filing of Patent Office #58

DISTRICT COURT OF THE UNITED STATES
NORTHERN DISTRICT OF OHIO
EASTERN DIVISION

Honorable Commissioner of Patents, Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (~~41~~ 42 Stat. L. .), you are advised that there was filed on the 15th day of December, 1931, in this court an action, suit, or proceeding, No. 4106 Equity, entitled—

Name The Cleveland Trust Company, Plaintiff
Address Cleveland, Ohio

versus

EE[2]
Name The Lawrence-Ohio Company, Defendant
Address Cleveland, Ohio

brought upon the following patents:

PATENT No.	DATE OF PATENT.	PATENTEE.
1,402,309	January 3, 1922	The Cleveland Trust Co.
1,763,523	June 10, 1930	The Cleveland Trust Co.
1,815,733	July 21, 1931	The Cleveland Trust Co.

In the above-entitled case, on the ..... day of ....., 193.., the following patents have been included by .....

(Insert amendment, answer, cross bill, or other pleading)

PATENT No.	DATE OF PATENT.	PATENTEE.

In the above-entitled case the following decision has been rendered or decree issued:

IN WITNESS WHEREOF, I have affixed my hand this 15th day of December, 1931, at Cleveland, Ohio.

~~B. C. Mullen,~~
F. J. Denzler,
Clerk.

By O. M. NELSON,
Deputy Clerk.

364997—110

(Mail Room Dec 19 1931 U. S. Patent Office)

#59

Notice on Filing of Patent Case

DISTRICT COURT OF THE UNITED STATES
NORTHERN DISTRICT OF OHIO
EASTERN DIVISION

Honorable Commissioner of Patents, Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (41 Stat. L.....), you are advised that there was filed on the ..... day of ....., 193 , in this court an action, suit, or proceeding, No. 3561 Equity, entitled—

Name The Cleveland Trust Company, Plaintiff
Address Cleveland, Ohio

versus

Name The Lawrence-Ohio Company,
Ray Day Piston Company, Defendant
Address 6529 Euclid Ave., Cleveland, Ohio
6656 Walton Ave., Detroit, Michigan.

brought upon the following patents:

D²

Patent No.	Date of Patent	Patentee
1,092,870	April 14, 1914	Edward O. Spillman & Louis P. Mooers
1,153,902	Sept. 21, 1915	Gustave E. Franquist
1,402,309	Jan. 3, 1922	The Cleveland Trust Company
1,763,523	June 10, 1930	The Cleveland Trust Company

In the above-entitled case, on the ..... day of....., 193.., the following patents have been included by .....
(Insert amendment, answer, cross bill, or other pleading)

Patent No.	Date of Patent	Patentee

In the above-entitled case the following decision has been rendered or decree issued:

Dec. 16, 1931—Order dismissing case without prejudice at plaintiff's costs, filed and entered. Jones *J.*

In Witness Whereof, I have affixed my hand this 18th day of December, 1931, at Cleveland, Ohio.

~~B. C. Meaam~~, *Clerk.*
F. J. Dennler,
By O. M. Nelson,
Deputy Clerk.

364997—111

(Mail Room Jun 11 1932 U. S. Patent Office)

Notice on Filing of Patent Case #60

DISTRICT COURT OF THE UNITED STATES

NORTHERN DISTRICT OF OHIO

EASTERN DIVISION

Honorable Commissioner of Patents, Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (~~41~~ 42 Stat. L....), you are advised that there was filed on the 15th day of December, 1931, in this court an action, suit, or proceeding, No. 4106, entitled—

Name The Cleveland Trust Company, Plaintiff
Address Cleveland, Ohio

versus

Name The Lawrence-Ohio Company, Defendant
Address Cleveland, Ohio

brought upon the following patents:

PATENT No.	DATE OF PATENT	PATENTEE
1,402,309	January 3, 1922	The Cleveland Trust Co.
1,763,523	June 10, 1930	The Cleveland Trust Co.
1,815,733	July 21, 1931	The Cleveland Trust Co.

In the above-entitled case, on the .... day of ...., 193.., the following patents have been included by .....
(Insert amendment, answer, cross bill, or other pleading)

PATENT No.	DATE OF PATENT	PATENTEE

In the above-entitled case the following decision has been rendered or decree issued:

June 10, 1932. Interlocutory Default Decree filed & ent. U. S. Letters Patent No. 1,815,733 good & valid in law as to claims 1, 15, 22, 25, to 30 incl. 41, 42, & 43: No. 1,763,523 good & valid in law as to claims ~~3, 4,~~ 1; No. 1,402,309 good & valid in law as to claims, 3, 4, 8, & 11; Pltf. is owner of each of the above Letters Patent; deft. has infringed each of the claims thereof; pltf. to recover of deft.; cause referred to C. D. Friebolin to determine amt. of damages sustained; injunction granted; costs vs. deft. West *J.*

In Witness Whereof, I have affixed my hand this 10th day of June, 1932, at Cleveland, Ohio.

B. C. Mazza, *Clerk.*
F. J. Denzler,
By W. L. Stevens,
Deputy Clerk.

364997—112

(Mail Room Sep 22 1932 U. S. Patent Office)

#61

DISTRICT COURT OF THE UNITED STATES

Eastern District of Michigan

Honorable Commissioner of Patents,
Washington, D. C.

Sir:

In compliance with the Act of February 18, 1922 (42 Stat. L. 392), you are advised that there was filed on the 19th day of September, 1932, in this court an action, suit, or proceeding No. 5564, entitled:

Name The Cleveland Trust Company, Plaintiff,
Address Cleveland, Ohio

versus

Name Ray Day Piston Corporation of Detroit, Defendant,
Address Detroit, Michigan

brought upon the following patents:

	Patent No.	Date of Patent	Patentee
1	1,402,309	Jan. 3d, 1922	Louis P. Mooers
2	1,763,523	June 10, 1930	Frank Jardine
3	1,815,733	July 20, 1931	Edward J. Gulick

In the above-entitled case, on the ..... day of ....., 193 , the following patents have been included by ..... (insert amendment, answer, cross bill, or other pleading):

Patent No.	Date of Patent	Patentee

In the above-entitled case the following decision has been rendered or decree issued:

IN WITNESS WHEREOF I have affixed my hand this Nineteenth day of September, 1932, at Detroit, Michigan.

ELMER W. VOORHEIS,
Clerk of said Court.

By: Albert L. Alhed,
Deputy Clerk.

364997—113

PRINTER'S NOTE:

A copy of U. S. Patent No. 1,763,523, June 10, 1930, to F. Jardine, was bound in the original of this Exhibit at this point, but inasmuch as it appears, *supra*, at page 1291, as Plaintiff's Exhibit No. 3, it has been omitted to comply with the Equity Rule against duplication.

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18/27.

1920

CONTENTS:

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3. Notices of Revocation and Acceptance June 23/20
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5. Renewal March 8, 1921
6. Amendment A March 8, 1921
7. Rej. Apr 9-1921
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11. Rej. May 6-22
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16. Amendment E May 3, 1923
17. Intf Brief "A"
18. Intf Letter "A" Jul 7-1923
19. Intf Brief "B"
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21. Intf Brief "C"
22. Intf Letter "C" Jul 7-1923
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24. Intf Letter "D" Jul 7-1923
25. Intf Brief "E"
26. Intf Letter "E" Jul 7-1923
27. Intf. Brief "H"
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44. Intf Letter "V" Jul 7-1923
45. Add. party Dec 3-1923
46. Party Added Dec 3-1923
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48. Sub. Power of Atty Nov. 5/23
49. " " " " Nov 12/25
50. Amendment F (not ent.) Aug. 13, 1928
51. Final Rejection (Rule 132) Feb 8-1930
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54. Exr's Amendment I May 28-1930
55. Notice of Suit Sept. 30-1930

364997—114

OK

	Search Made	
	Class	Date
56. Notice of Suit		Oct. 27-1930
57. Notice of Suit		Sept. 29-1931
58. Notice of Suit		Dec. 16-1931
59. Notice of Suit		Dec. 19-1931
60. Notice of Suit		June 11-1932
61. Notice of Suit		Sept. 22-1932
62.		

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DEFENDANTS' EXHIBIT 4-L$_3$.

File Wrapper and Contents of Schmiedeknecht Patent Patent in Suit.

(Filed January 27, 1934.)

390

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of the File Wrapper and Contents, in the matter of the Letters Patent of Victor E. Schmiedeknecht, Number 1,256,265, Granted February 12, 1918 for Improvement in Pistons.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this fourteenth day of January, in the year of our Lord one thousand nine hundred and thirty-three and of the Independence of the United States of America the one hundred and fifty-seventh.

THOMAS E. ROBERTSON,
(Seal) *Commissioner of Patents.*

ATTEST:

D. E. WILSON,
Chief of Division.

NUMBER (SERIES OF 1915),
180511 1917
DIV. 12 PATENT NO. 1256265 (EX'R'S BOOK) 74-9 B
Name Victor E. Schmiedeknecht
of Louisville
County of
State of Kentucky.
Invention Pistons.

PARTS OF APPLICATION FILED.

	Original.	Renewed.
Petition	July 14, 1917	, 191
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" " Cert. , 191 , 191
Patented Feb. 12, 1918 , 191

Attorney William B. Munnell, 414 S. Third Street
Louisville, Ky.
2
Associate Attorney
3
(No. of Claims Allowed 3) Title as Allowed Piston.
(Cl. 74-85)
O. G. Cl. 2

Division of App. No....., filed....., 191..

6295

($15 Rec. Jul 14 1917 dft E C. C. U. S. Pat. Office)
(Jul 17 1917 U. S. Patent Office $15 Dft)

(1) 180,511
265 Division 12, Paper No. 1

PETITION

To the Commissioner of Patents:

Your petitioner, Victor E. Schmiedeknecht, a citizen of the United States, residing in the city of Louisville county of Jefferson, and state of Kentucky, whose post office address is 723 W. Jefferson, prays that letters patent may be granted to him for the improvement in "Pistons" set forth in the annexed specification.

And he hereby appoints William B. Munnell of 414 S. Third street, Louisville Kentucky, whose registration number is 9063, his attorney, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent and to transact all business in the Patent Office connected therewith.

Signed at Louisville, in the county of Jefferson and state of Kentucky this 11th day of July, 1917.

Inventor's full name VICTOR E. SCHMIEDEKNECHT.

180511—1

6296

~~SPECIFICATION~~

To all whom it may concern:

Be it known that I, VICTOR E. SCHMIEDEKNECHT, a citizen of the United States, residing at Louisville, in the county of Jefferson, and State of Kentucky, have invented a new and useful Improvement in "Pistons," of which the following is a specification.

This invention relates to pistons for internal combustion motors.

It has been ascertained to be essential that pistons of internal combustion motors should be as light as possible. In accordance with accepted construction pistons are hollow cylinders, closed at one end and open at the other, a connecting rod being secured interiorly thereof intermediate of their length by means of a transverse pin. Bosses projected inward from the side walls of the piston provide bearings for the pin. It was formerly ~~thot~~ thought that a shearing stress was exerted on this pin, and that the strain was transmitted to the side walls longitudinal thereof, and that the metal being under compression, the wall could be very thin, but failure of piston walls so constructed lead to the conclusion that the connecting rod exerted a bending stress on the pin by which a lateral strain was transmitted to the walls causing them to fracture around the bosses. This discovery necessitated an increase in the thickness of the walls and the use of braces or brackets extended from the bosses to the piston head, or to the wall, but these expedients tend to increase the weight of the piston. To reduce piston weight, resort has been had to the use of metals (such as aluminum, or alloys

thereof) which have a lower specific gravity than cast iron, the metal commonally used; but the co-

(1) 180511—2

Schmiedeknecht—Pistons 6297

efficient of expansion of alluminum is greater than that of iron, of which motor cylinders are generally made. Consequently it is difficult to get a proper fit, as for if the piston is of such size as to fit in the cylinder properly when at maximum temperature, gas and oil will leak by, when as at starting, the piston is cool.

per A

per A

An object of this invention is to provide a piston of minimum weight, with maximum structural strength.

To the accomplishment of the foregoing and other objects, said invention consists of the novel construction, association and relative arrangement of parts, members and features hereinafter fully described and particularly pointed out in the claims appended hereunto.

In the drawing, wherein similar reference characters designate like parts in the several views, Figure 1, is a front elevation of an embodiment of the invention: Fig. 2, a side elevation thereof: Fig. 3, a central transverse section on Fig. 1: Fig. 4, a bottom plan view: and Fig. 5, a fragmental sectional view.

per A

" "

Referering now in detail to the drawing, the reference character —10— designates, as an ~~entiety~~ entirety, a piston, the side walls, —11— of which are provided with a plurality of grooves —12— adapted for the reception of piston rings. An oil ~~ring~~ groove —13— is located just below the groups of piston ring grooves, and from the floor of this groove, a plurality of perforations —15— lead ~~thr~~through the wall of the piston, and serve as an avenue of escape for oil that may accumulate beneath the lower ring during the down stroke of the piston. The floor of this groove, is suitably inclined to facilitate the operation of drilling the holes, 15. The only portions of the apron of the piston (*i.e.* that portion of the wall which depends below the pin) which bear efficiently against the walls of the cylinder are those, fore and aft, which lie in the plane of the movement of the connecting rod about the pin. The side por-

(2) 180511—3

Schmiedeknecht—Pistons 6298

tions (those below the ends of the pin) serve to steady the piston against lateral motion. I remove a portions

of said apron, leaving ~~an~~ openings —16— each of which extends circumferentially approximately one per A ~~sixth~~ **third** of the distance around the piston, and longitudinally from a point just below the oil groove to within a spaced distance of the lower end of the piston, leaving a band —18— of sufficient width to give a satisfactory bearing surface. Alined bearings —19— each of which has a suitable bore —20— for the reception of a piston ~~ring~~ pin, are attached at per A 9 their outer ends to the **head section at the** upper edge of the openings —16— centrally thereof. per A The inner end of each of the bearings ~~are~~ **is** supported by a transverse bridge or truss —21— joined respectively, centrally to the bearings and terminally to the edges of the portions 17 of the apron of the piston.

per A It is ~~thot~~ **thought** that the many advantages of a piston constructed in accordance with the foregoing description will be evident to those skilled in the art.

The walls may be considerable thinner than with the usual construction, as they are not subjected to lateral strain, the bearings being supported on the inner end by a bridge supported by the side walls, which gives great rigidity to them, offering a maximum resistance to the bending strain exerted by the pin. The removal of portions of the apron also serves to reduce the weight.

It is to be understood that applicant reserves the right to resort to such changes, modifications, and variations, as may properly come within the scope of the appended claims.

Having thus described my invention so that those skilled in the art may make and use the same,

I claim:

180511—4

Schmiedeknecht—Pistons 6299

~~Claims~~

per A 1. A piston comprising a head **section** and a depending apron having oppositely disposed openings therein, alined bearings the outer ends per A of which are suspended from said ~~apron~~ **head section** within said openings, and bridges sustaining the inner ends of said bearings.

per A 2. A piston comprising a head **section**, and per A a depending cylindrical ~~side walls~~, **apron** said

~~side walls~~ **head section** being provided with a plurality of grooves for the reception of rings, and an oil groove having perforations leading from its
per B floor to the interior of the piston, said ~~wall~~ **apron** having an opening below said oil groove, a bearing the outer end of which is suspended
per A 6 from the **head section at** upper edge of said opening, and a transverse bar attached respectively
per A to the inner end of said bearing and to the ~~side wall~~ **apron.**

3. A piston, comprising a head, and a depending apron having an opening therein, a bearing the
per A outer end of which is attached to the **head at the** upper edge of said opening, and a transverse bar adapted to support the inner end of said bearing.

~~Applicants full Name~~ Victor E. Schmiedeknecht.

180511—5

6300

OATH

COUNTY OF JEFFERSON,
STATE OF KENTUCKY, S.S.

Victor E. Schmiedeknecht, the above named petitioner, being duly sworn, deposes and says that he is a citizen of the United States, residing at 427 Western Parkway, in the city of Louisville, county of Jefferson and state of Kentucky: that he verily believes himself to be the first, sole and original inventor of the improvement in "Pistons" described and claimed in the annexed specification: that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof or more than two years prior to this application, or on sale or in public use in the United States more than two years prior to this application, that said invention has not been patented in any country foreign to the United States on any application filed by him or his legal representatives or assigns more than twelve months prior to this application, and that no application has been filed by him or his legal representatives or assigns in any country foreign to the United States.

Inventor's full Name VICTOR E. SCHMIEDEKNECHT.

Sworn to and subscribed, before me in the city of Louisville, county of Jefferson and state of Kentucky, this 11th day of July 1917.

ELIZABETH K. BIRD,
(Notarial Seal) *Notary Public.*

My Commission Expires January 20, 1918.

180511—6

(Patent Office Oct 9 1917 Mailed)

2—260

Div. 12 Room 322 N/h **Paper No. 2**

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington

October 9th, 1917.

William B. Munnell,
414 S. Third Street,
Louisville Kentucky.

Please find below a communication from the Examiner in charge of the application of Victor E. Schmiedeknecht, for Pistons, filed July 14, 1917, Serial Number 180,511.

JAMES T. NEWTON,
Commissioner of Patents.

This case has been examined.

Page 1, line 13 "thought" is misspelled. Line 22, change "tend" to *tending*. Line 24, "aluminum" is misspelled.

Page 2 line 2 change the comma after made to a period and capitalize the first letter of "consequently." Line 3, change "as" to *for*. Line 17 "referring" is misspelled. Line 18, "entirety" is misspelled.

Page 4, line 3 the openings "16" seem to extend more than 1/6 the way around the piston. Line 9 is objectionable. The bearings 19 are attached to the "head at the upper edge of the opening 16." Line 10 change "are" to *is*. Line 13 "thought" is misspelled.

In claim 1 line 3 "apron" should be changed to *head*.

Claim 2 is objectionable in the following respects.

Line 1 "side" should be cancelled and *a* inserted before "depending." Line 2 "walls" should be changed to *apron* and "side walls" changed to *head* after said. Line 4, "wall" should be changed to *apron*. Line 6, insert *head at the* before "upper." Last line change "side

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Page 2—#180,511.

wall" to *apron*.

In claim 3, line 3 insert *head at the* before "upper."

The claims barring the informalities above noted are probably allowable.

The following patents are made of record—

Spillman et al, 1,092,870, April 14, 1914, (74-85),
British to Pugh, 17,356, July 27, 1907, (sheet 1) (74-85)

Rohm, 1,232,846, July 10, 1917, (74-85).
Green, 1,228,909, June 5, 1917, (74-85).

L. A. Sadler,
Exr. Div. 12

N 180,511—8

(Mail Room Nov 17 1917 U. S. Patent Office)

Division 12, Paper No. 3
A Nov 19 1917
U. S. Patent Office.

Div. 12, Room 322
in re V. Schmiedeknecht
Pistons

Filed July 14, 1917
#180,511
Responsive to action of
Oct. 9, 1917.

A
Hon. Commissioner of Patents:

Sir:

Amend the above noted case as follows:

Page 1, line 13, correct the spelling of "thought"
line 24, correct the spelling of "aluminum"

Page 2, line 2, change the comma after "made" to a period and capitalize "consequently"
line 3, change "as" to *for*
line 17, correct the spelling of "referring"
line 18, correct the spelling of "entirety"
Page 3, line 3, change "one sixth" to *one third*
line 9, before "upper" insert *head section at the;*
line 10, change "are" to *is*
line 13, change "thot" to *thought*
Claim 1, line 1, after "head" insert *section*
line 3, change "apron" to *head section*
Claim 2, line 1, after "head" insert *section:* insert *a;* before "depending" erase "side"
line 2, change "walls" to *apron*: change "side walls" to *head section*
line 6, insert *head section at the* before "upper"
last line change "side wall" to *apron*
Claim 3, line 3, insert *head at the* before "upper"

And pass the claim case to issue.

Respectfully submitted,

W. B. MUNNELL,
Attorney for Applicant.

Louisville Ky.
Nov. 15, 1917

180511—9

(Patent Office Nov 24 1917 Mailed)

2—260

Div. 12 Room 322 N/h Paper No. 4

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington
November 24, 1917.

William B. Munnell,
414 S. Third Street,
Louisville, Ky.

Please find below a communication from the Examiner in charge of the application of Victor E. Schmiedeknecht, for Pistons, filed July 14, 1917, Serial Number 180,511.

JAMES T. NEWTON,
Commissioner of Patents.

In response to amendment filed November 17, 1917.

Page 1, line 22, should not "tend" be changed to *tending*.

Claim 2 line 4, change "wall" to *apron*.

The case is otherwise ready for allowance.

L. A. SADLER,
Exr. Div. 12.

N 180511—10

(Mail Room Dec 3 1917 U. S. Patent Office)

For Div. 12
Division 12, Paper No. 5
B Dec 5 1917
U. S. Patent Office

Div. 12, Room 322
in re V. Schmiedeknecht
Pistons

Filed July 14, 1917
#180,511
Responsive to action of
Nov. 24, 1917.

B

Hon. Commissioner of Patents:

Sir:

Amend the above noted application as follows:

Claim 2, line 4, change "wall" to *apron*

REMARKS

Applicant is of the opinion that the use of "tend" in line 22, of page 1, is proper, as the "expedients" referred to are present practice.

Respectfully submitted,

W. B. MUNNELL,
Attorney for Applicant.

Louisville Ky.
Nov. 26 30, 1917.

180511—11

(Patent Office Dec 12 1917 Mailed)

2—260

Div. 12 Room 322 Paper No. 6

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington

Dec. 12, 1917.

William B. Munnell,
414 South Third st.,
Louisville, Ky.

Please find below a communication from the Examiner in charge of the application of Victor E. Schmiedeknecht, filed July 14, 1917, Pistons, Serial No. 180,511.

JAMES T. NEWTON,
Commissioner of Patents.

Case reconsidered as amended Dec. 3, 1917.

Applicant evidently has not read the sentence beginning on line 19, carefully since the use of "tend," in line 22, undoubtedly renders the sentence ungrammatical.

If "tend" be retained it will be necessary to insert "but" before "these".

The case is otherwise allowable.

L. A. SADLER,
Exr. Div. 12.

N.
N

180511—12

(Mail Room Dec 17 1917 U. S. Patent Office)

Division 12, Paper No. 7
C
Dec 19 1917
U. S. Patent Office

Div. 12, Room 322
in re V. Schmiedeknecht
Pistons

Filed July 14, 1917
#180,511
Responsive to action of
Dec. 12, 1917.

C

Hon. Commissioner of Patents:

Sir:

Amend the above noted application as follows:

Page 1, line 22, insert *but* before "these"

At the end of line 20, insert *the use of*

Respectfully submitted,
W. B. MUNNELL,
Attorney for Applicant.

Louisville Ky.
Dec. 15, 1917.

180511—13

2—181

Serial No. 180,511

Address only
The Commissioner of Patents,
Washington, D. C.

AH

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington Dec., 28, 1917.

Victor E. Schmiedeknecht,

Sir: Your Application for a patent for an Improvement in Piston, filed July 14, 1917, has been examined and Allowed.

The final fee, Twenty Dollars, must be paid not later than Six Months from the date of this present notice of allowance. If the final fee be not paid within that period, the patent on this application will be withheld, unless renewed with an additional fee of $15, under the provisions of Section 4897, Revised Statutes.

The office delivers patents upon the day of their date, and on which their term begins to run. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will require about four weeks, and such work will not be undertaken until after payment of the necessary fee.

When you send the final fee you will also send, Distinctly and Plainly Written, the name of the Inventor, Title of Invention, and Serial Number as Above Given, Date of Allowance (which is the date of this circular), Date of Filing, and, if assigned, the Names of the Assignees.

If you desire to have the patent issue to Assignees, an assignment containing a Request to that effect, together with the Fee for recording the same, must be filed in this office on or before the date of payment of final fee.

After issue of the patent uncertified copies of the drawings and specifications may be purchased at the price of Five Cents Each. The money should accompany the order. Postage stamps will not be received.

Final fees will Not be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Respectfully,

~~Thomas Ewing,~~

J. I. Newton,

Commissioner of Patents.

William B. Munnell,
414 South Third Street,
Louisville, Ky.,

☞In Remitting the Final Fee Give the Serial Number at the Head of this Notice.

☞Uncertified Checks Will Not Be Accepted.

180511—14

($20. Rec'd Jan 17 1918 C. C. U. S. Pat. Office)

Patents Obtained — Mechanical Expert
Trade Marks Registered — Inventions Developed

W. B. MUNNELL
REGISTERED PATENT ATTORNEY
414 S. Third Street, Louisville, Ky.

Jan. 14, 1918.

in re V. E. Schmiedeknecht
Piston
Filed July 14, 1917
Allowed Dec. 26, 1917.
#180,511

Hon. Commissioner of Patents:
Sir:

Herewith find New York Draft #A13087, for C $20.00, being the final fee in the above noted case.

Enclosed find coupon order for which please send me a printed copy of the patent when issued.

Respectfully,

W. B. MUNNELL,
Attorney for Applicant.

WBM-McA
(encl)
to Div. F

180511—15

(Mail Room Sep 30 1930 U. S. Patent Office)

#9

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF OHIO (EASTERN DIVISION)

Honorable Commissioner of Patents,
Washington, D. C.

Sir:

In compliance with the Act of February 18, 1922 (41 42 Stat. L. .....), you are advised that there was filed on the 29th day of September 19230, in this court an action, suit, or proceeding No. 3510 entitled

Name The Cleveland Trust Company Plaintiff
Address Cleveland, Ohio
Chrysler Corporation
Highland Park, Michigan

versus

Name The Simmons Manufacturing Company
Address 3405 Perkins Ave., Cleveland, Ohio
Sterling Products Corporation
2914 North Market St., St. Louis, Missouri
Defendant

brought upon the following patents:

Patent No.	Date of Patent.	Patentee.
1,092,870	April 14, 1914	Edward O. Spillman and Louis P. Mooers
1,402,309	Jan. 3, 1922	L. P. Mooers
1,153,902	Sept. 21, 1915	Gustave E. Franquist
~~1,473,233~~ 16,273 Reissue	~~Nov. 6, 1923~~ Feb. 23, 1926	H. & H. Machine Company Cleveland Trust Company
1,655,968	Jan. 10, 1928	Chrysler Corporation and Aluminum Co.
1,763,523	June 10, 1930	Cleveland Trust Company
1,256,265	Feb. 12, 1918	Victor E. Schmiedeknecht

Patent No.	Date of Patent.	Patentee.

In the above-entitled case the following decision has been rendered or decree issued:

In Witness Whereof I have affixed my hand this 29th day of Sept., 1930, at Cleveland, Ohio.

~~B. C. Murfin,~~
F. J. Denzler,
Clerk of said Court,
By Ruth Strain,
Deputy Clerk.

180511—16

(Mail Room Sep 29 1931 U. S. Patent Office)

Notice of Filing of Patent Case

DISTRICT COURT OF THE UNITED STATES
Northern District of Ohio
Eastern Division

Honorable Commissioner of Patents, Washington, D. C.

Sir:

In compliance with the Act of February 18, 1922 (41 Stat. L. ....), you are advised that there was filed

on the 29th day of September, 1930, ~~1931,~~ in this court an action, suit, or proceeding, No. 3510, entitled—

Name The Cleveland, Trust Company, Cleveland, Ohio
Name Chrysler Corporation Michigan Plaintiff
~~Address~~

versus

Name The Simons Manufacturing Company, Cleveland, Ohio
Name Sterling Products Corporation, St. Louis, Missouri Defendant
~~Address~~

brought upon the following patents:

Patent No.	Date of Patent	Patentee
1,092,870	April 14, 1914	Edward O. Spillman & Louis P. Mooer
1,402,309	Jan. 3, 1922	L. P. Mooers
1,153,902	Sept. 21, 1915	Gustave E. Franquist
1,473,233	Nov. 6, 1923	H. & H. Machine Company
16,273 Reissue	Feb. 23, 1926	Cleveland Trust Company
1,655,968	Jan. 10, 1928	Chrysler Corp. and Aluminum Co.
1,763,523	June 10, 1930	Cleveland Trust Company
1,256,265	Feb. 12, 1918	Victor E. Schmiedeknecht

In the above-entitled case, on the ..... day of ....., 193.., the following patents have been included by .....
(Insert amendment, answer, cross bill, or other pleading)

Patent No.	Date of Patent	Patentee

In the above-entitled case the following decision has been rendered or decree issued: Sept. 25, 1931 Interlocutory Decree filed & ent.; Letters Patent Nos. 1,092,870, 1,153,902, 1,256,265, 1,402,309, Re-16,273, good and valid in law; The Cleveland Trust Co. owner; Letters Patent No. 1,655,968, good and valid in law; The Cleveland Trust Co. and Chrysler Corp. owner; Letters Patent Nos. 1,763,523, 1,815,733 are good and valid in law and pltf. The Cleveland Trust Co. owner; that defendant the Simmons Manufacturing Co. has infringed all of said Letters Patent; Plaintiff to recover of defendant;

that cause be referred to Wm. B. Woods, Special Master for accounting; injunction granted; Pltf. to recover of defendant costs Jones Judge

IN WITNESS WHEREOF, I have affixed my hand this 28th day of September, 1931, at Cleveland, Ohio.

~~B. C. MILLER~~, *Clerk.*
F. J. Denzler
By W. L. STEVENS,
Deputy Clerk.

180511—17

PRINTER'S NOTE:

A copy of U. S. Patent No. 1,256,265, Feb. 12, 1918, to V. E. Schmiedeknecht, was bound into the original of this Exhibit at this point, but inasmuch as it appears *supra*, at page 1305, as Plaintiff's Exhibit No. 5, it has been omitted to comply with the Equity Rule against duplication.

2—421

1917

CONTENTS:

74 Machine Elements Guides, Cylindrical
1256265

1. Application 1 papers.
2. **Letter** Oct 9 1917
3. Amendment **A** **Nov. 17, 1917**
4. **Letter** Nov 24 1917
5. Amendment **B** **Dec. 3, 1917**
6. **Letter** **Dec. 12, 1917**
7. Amendment **C** **Dec. 17, 1917**
8. Notice of Suit **Sept. 30-1930**
9. Notice of Suit **Sept. 29-1931**

180511—18

DEFENDANTS' EXHIBIT 4-L$_4$.

File Wrapper and Contents of Maynard Patent in Suit.

(Filed January 27, 1934.)

390

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of the File Wrapper and Contents, in the matter of the Letters Patent of Howard E. Maynard, Assignor, by Direct and Mesne Assignments, of one-half to Chrysler Corporation and one-half to Aluminum Company of America, Number 1,655,968, Granted January 10, 1928, for Improvement in Pistons.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this fourteenth day of January, in the year of our Lord one thousand nine hundred and thirty-three and of the Independence of the United States of America the one hundred and fifty-seventh.

THOMAS E. ROBERTSON,
Commissioner of Patents.

(Seal)

ATTEST:

D. E. WILSON,
Chief of Division.

NUMBER (SERIES OF ~~1925~~ 1915)
434467

~~1927~~ 1921

PATENT No. 1655968
Dated Jan 10 1928

DIV. 12 (EX'R'S BOOK).....

Name Howard E. Maynard

(Old wrapper with record of actions inside)

of
State of
Invention Pistons

PARTS OF APPLICATION FILED.

Original	Renewed
Application filed complete , 1927	
Petition, Specification, Oath, First Fee $20, .. sheets Drawings, } , 1927	
Examined and passed for Issue Nov 25, 1927	Reexam'd and passed for Issue , 192
P. P. Pierce Exr. Div. 12	Exr. Div.
Notice of Allowance Nov 25 1927 , 192	Notice of Allowance , 192
By Commissioner.	By Commissioner.
Final Fee $20 Dec 15, 1927	Final Fee , 192

Attorney
Associate Attorney
No. of Claims Allowed 11 Print Claims in O. G. Class
Title as Allowed
Division of App., No. , filed , 19

1921

Number (Series of 1915), 434467 (Ex'r's Book) 128—1-D
Div. 12
(4)

PATENT NO. .....

Name Howard E. Maynard Assor by direct and mesne assigts of ½ to Chrysler Corporation, of Highland Park, Mich., a corp. of Delaware, and ½ to Aluminum ~~Manufacturers, Inc., of Cleveland, Ohio, a Corp. of Delaware~~ Company of America, of Pittsburgh, Penna., a corp. of Pennsylvania.
of Detroit
County of
State of Michigan
Invention Pistons

1	2
24	26
	27
	55

PARTS OF APPLICATION FILED.

	Original	Renewed
Petition	Jan 3, 1921	, 192
Affidavit	" ", 1921	, 192
Specification	" ", 1921	, 192
Drawing	" ", 1921	, 192
Photo Copy	May 18, 1923	, 192
First Fee Cash $15	Jan 3, 1921	, 192
" " Cert.	, 192	, 192
Appl. filed complete	Jan 3, 1921	, 192
Examined and Passed for Issue	Nov 25, 1927	, 192
	P. P. Pierce Exr. Div. 12	Exr. Div.
Notice of Allowance	Nov 25, 1927	, 192
	By Commissioner.	By Commissioner
Final Fee Cash $20	Dec 15, 1927	, 192
" " Cert.	, 192	, 192
Patented		, 192

Attorney **Whittemore, Hulbert & Whittemore Penobscot Bldg. Detroit, Mich**

Associate Attorney **J. King Harness, 1211 Majestic Bldg. Detroit, Michigan**

(No. of Claims Allowed **11**) Print Claims **1** in O. G. (Cl. **74-108.**)

Title as Allowed **Pistons**

Division of App., No. ....., filed ....., 191..

434467

($15 Rec'd Jan 3 1921 C. C. U. S. Pat. Office **Ck 5**)

Division 12, **Paper No. 1**
Jan 6 1921
U. S. Patent Office

James Whittemore
Prescott M. Hulbert
Laurence J. Whittemore
Wm. J. Belknap.

Patent and Trade Mark Practice

Law Offices of
WHITTEMORE, HULBERT & WHITTEMORE
Suite 1112 Penobscot Building
Detroit, Mich., December 30, 1920.

Hon. Commissioner of Patents,
Washington, D. C.

Sir—

provement in Pistons (Attorneys' Number 15,556), together with check for $15.00 to cover the filing fee thereon.

Kindly acknowledge receipt, and oblige

Very respectfully,

JPB
ines

WHITTEMORE, HULBERT & WHITTEMORE.

434467—1

8442

(Mail Room Jan 3 1921 U. S. Patent Office)

434467

Division 12, **Paper No. 1**
Jan 6 1921

No. 15,556. U. S. Patent Office

PETITION

To the Commissioner of Patents:

Your petitioner, Howard E. Maynard, a citizen of the United States of America, residing at Detroit, (Post-office Address: #700 Calvert Avenue), in the County of Wayne, in the State of Michigan, prays that Letters Patent may be granted to him for the improvement in PISTONS, set forth in the annexed specification.

And he hereby appoints Whittemore, Hulbert & Whittemore, a firm composed of James Whittemore, Prescott M. Hulbert and Laurence J. Whittemore and William J. Belknap, of Detroit, Michigan, his attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to sign the drawings, to receive the Patent, and to transact all business in the Patent Office connected therewith.

HOWARD E. MAYNARD.

(United States Documentary Stamp 25 Cents W.H.&W.)

SPECIFICATION.

To all whom it may concern:

BE IT KNOWN that I, Howard E. Maynard, a citizen of the United States of America, residing at Detroit, in the County of Wayne and State of Michigan, have invented certain new and useful improvements in PISTONS,

of which the following is a specification, reference being had therein to the accompanying drawings:

434467—2

15,556. 8443

Filed

The invention relates to pistons designed for use in internal combustion engines and has for its object the prevention of "pumping" of oil and the "freezing" due to excessive expansion. In the present state of the art it is usual to construct pistons with a cylindrical ring portion having a relatively large clearance with reference to the diameter of the cylinder, and a skirt portion more closely fitting the same and which holds the piston in proper alignment and prevents side slapping. To avoid sticking or freezing of this skirt, due to expansion, certain constructions of pistons have provided the skirt with a longitudinal slot therein to compensate for expansion, but there is one serious difficulty with all such constructions, viz., the tendency for the lubricating oil to work up beyond the skirt and rings and into the explosion chamber. This results in the formation of carbon and other difficulties incident thereto. With the present invention I have overcome this difficulty by arranging between the cylindrical ring portion and the skirt portion a continuous annular groove. This will receive the oil creeping past the skirt and permitting the same to drop back in the cylinder without providing any bridge for its passage to the ring portion. The result is that the cylinder will be fully lubricated, while the excess of lubricant will be scraped off by the lowermost piston rings into the annular groove, where it is permitted to drop back into the cylinder.

In the drawings:

Figure 1 is a perspective view of my improved construction;

—2— 434467—3

8444

Figure 2 is a transverse section thereof; and

Figure 3 is a similar view in plane at right angles to Figure 2.

A is the piston head having a depending cylindrical portion B grooved to receive the rings C and of a diameter to afford abundant clearance within the engine cyl-

inder. D is a skirt, which is preferably of a diameter to closely fit the cylinder. This skirt is itself discontinuous with the cylindrical portion B of the piston, being separated therefrom by a groove E, which extends completely around the same. The connection between the two parts is formed by webs F on diametrically opposite sides of the piston, said webs extending inward from the portion B and vertically downward and having formed integral therewith the bearings G for the wrist pin. These webs are connected to the skirt on their opposite vertical edges, but are not connected thereto either at top or bottom. Thus there are formed the recesses H surrounding the bearings G with segmental skirt portions on opposite sides thereof and an annular skirt portion below said segmental skirt portions. One of the sides of the skirt between the points of attachment of the webs thereto is longitudinally slitted, as indicated at I, and this slit compensates for expansion and permits the skirt to conform itself to the cylinder.

With the construction as described, when the piston is in operation, the lubricant upon the wall of the

cylinder is spread by the skirt portion of the piston and will be forced upward to the groove E at the upper end of the skirt. Further creeping is prevented by this groove and when the accumulation of oil is sufficient, it will drop back inside of the skirt. At no time is there a body of the oil adjacent to the piston rings and for this reason when the engine is upon suction stroke, any leakage past the ring cannot draw oil upward. As a further safeguard, the cylindrical portion B below the lowermost of the ring C is cut away to provide a further clearance, as indicated at J, this clearance being sufficient to prevent the bridging of the oil thereacross. Thus on each downward stroke of the piston, the lowermost ring will scrape all surplus oil from the surface of the cylinder and in the upward stroke the oil thus accumulated will pass through the groove E and downward. Any oil accumulating in the recesses H will follow down the webs F and there is no chance at any point for the accumulation of oil adjacent to the rings. (X)

What I claim as my invention is:

Per C
Per B
Insert C¹
Per A
Ricardo
view of
Ebbs

1. A piston comprising a cylindrical ring portion and a ~~split~~ cylindrical skirt portion forming a guide for the piston C¹, said portions being separated from each other by a continuous circumferential groove, web portions for connecting said cylindrical portion and skirt portion, and wrist pin bearings in said webs.

Per C
Per B
Insert C²
Per A
Cls 1

2. A piston comprising a cylindrical ring portion and a ~~split~~ cylindrical skirt portion forming a guide for the piston C², said portions being separated by a continuous annular slot passing completely therethrough, webs for connecting said skirt and ring portion, located within the inner diameter thereof, being attached to the skirt only at their opposite vertical edges and to the ring portion only at the top, and wrist pin bearings formed integral with said webs.

Per E

3 1E. A piston comprising a head having a cylindrical ring portion depending therefrom and a skirt portion arranged beneath said ring portion and separated therefrom by a continuous annular

Insert I¹
Per I
Per E

groove, (1) I¹ webs on diametrically opposite sides of the piston, extending inward from said cylindrical portion and vertically downward, the opposite edges of said webs being connected to the ~~segments of~~ said segmental portions of the skirt, ~~extending between said webs,~~ and said skirt having an annular portion below said segmental portions disconnected from the lower ends of said web.

4 23. A piston comprising a head having a depending cylindrical ring portion of relatively large clearance with respect to the diameter of the cylinder, and a skirt portion below said ring portion closely fitting said cyl-

inder and separated from the ring portion by a continuous annular groove, webs on diametrically opposite sides of said piston extending inward from said cylindrical

portion and downward parallel to each other, the opposite vertical edges of said webs being connected
Per E to ~~segmental portions of~~ the skirt ~~extending~~
" E ~~therebetween,~~ said skirt having an annular por-
Per E tion below said ~~segmental portions~~ webs disconnected from the lower ends of said webs and there being also provided a slit completely through the skirt from the lower to the upper end there-
Insert E¹ of, and wrist pin bearings carried by said webs. (Cl. 3-5)

5. A piston comprising a head portion, a cylindrical ring portion depending therefrom and a skirt portion arranged below said ring portion and separated therefrom by a continuous annular groove, said
Sub. B¹ cylindrical ring portion being reduced in diameter below the lowermost ring to provide a large clearance between the same and the cylinder, and webs connecting said cylindrical portion and skirt portion also carrying the wrist pin bearings.

434467—7
8448

In testimony whereof I affix my signature.

HOWARD E. MAYNARD.

OATH

State of Michigan, County of Wayne, ss:

HOWARD E. MAYNARD, the above named petitioner, being duly sworn, deposes and says that he is a citizen of the United States of America, and resident of Detroit, Wayne County, Michigan; that he verily believes himself to be the original, first and sole inventor of the improvement in Pistons, described and claimed in the annexed specifications; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any Country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application;

and that no application for patent on said improvement has been filed by him or his representatives or assigns in any country foreign to the United States.

HOWARD E. MAYNARD.

Subscribed and sworn to before me this 22nd of December, 1920.

JAMES P. BARRY,

(Notarial Seal) *Notary Public in and for Wayne County, Michigan.*

My Commission expires October 2/1921.

434467—8

(Patent Office Apr 9-1921 Mail Room)

2—260

Div. 12 Room 322 **Paper No. 2**

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

Ch-D UNITED STATES PATENT OFFICE

Washington Apr. 9, 1921

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a communication from the Examiner in charge of the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467 Pistons

THOMAS E. ROBERTSON,
Commissioner of Patents.

Claims 1 and 5 are rejected on
Spillman *et al.*, 1,2092,870, Apr. 14, 1914 (74-108)

Claim 2 is rejected on
Ricardo, 1,294,833, Feb. 18, 1919 (74-108)

The remaining claims appear allowable as at the present advised.

P. P. PIERCE,
Examiner.

V.I.C.

434467—9

(Mail Room Sep 12 1921 U. S. Patent Office)

A

Division 12, **Paper No. 3**
Sep 13 1921
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

Div. 12, Room 322,
Howard E. Maynard,
Piston,
Filed Jan. 3, 1921,
Ser. No. 434,467.

Detroit, Mich., August 31, 1921.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:

In the matter of the above entitled interference and with reference to Office Letter of April 9, 1921, amendment is hereby made as follows:

Claim 1, line 2, before "skirt" insert —*split*—.

Claim 2, line 2, before "skirt" insert —*split cylindrical*—.

REMARKS

Claim 1, as now amended, brings out applicant's skirt portion as split as distinguished from the Spillman construction. As this feature of applicant's device provides for taking care of the contraction and expansion of the piston, claim 1 is now believed to clearly and patentably differentiate from the reference. As ~~this~~ claim 5 was rejected on this same reference, the Examiner's attention is directed to the fact that this claim recites said cylindrical rim portion being reduced in diameter below the lowermost ring to provide a large clearance between

434467—10

the same and the cylinder. The Spillman *et al.* construction is entirely lacking in this respect and as this

clearance operates as a further safe-guard, being sufficient to prevent the bridging of the oil thereacross another and more favorable reconsideration of this claim is earnestly solicited.

Claim 2, as now amended, describes applicant's skirt portion as split and cylindrical and in this respect is believed to clearly avoid Ricardo whose corresponding portion is not cylindrical but is formed by the segments E. In view of the foregoing remarks and in the absence of more pertinent art an early allowance of the claims as now submitted, is earnestly solicited.

Respectfully submitted,

HOWARD E. MAYNARD,
By WHITTEMORE, HULBERT & WHITTEMORE,
Attorneys.

ADP/LS

434467—11

(Patent Office Jan 9 1922 Mailed)

2—260

Div. 12 Room 322 Paper No. 4

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Ch-D Washington Jan. 9, 1922

Whittemore, Hulbert, & Whittemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a communication from the Examiner in charge of the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467 Pistons

THOMAS E. ROBERTSON,
Commissioner of Patents.

Responsive to the amendment of Sept. 12, 1922.

Claims 1 and 2 are again rejected on Ricardo, of record. The only difference between applicant's structure and that of Ricardo appears to be in the size of the gap between the skirt sections.

Claim 5 is rejected on Spillman *et al.*, of record in view of either

Howe, 908,569, Jan. 5, 1909 (74-109-4) or
Lowther, 1,298,234, Mar. 25, 1919 (74-108-2).

The remaining claims are allowed.

P. P. PIERCE,
Examiner.

V.I.C.

434467—12

(Mail Room Feb 2 1922 U. S. Patent Office)

Division 12, **Paper No. 5**
Feb 3 1922
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

Div. 12, Room 322,
HOWARD E. MAYNARD,
Piston,
Filed January 3, 1921,
Serial No. 434,467.

Detroit, Michigan, January 23, 1922.

HON. COMMISSIONER OF PATENTS,
Washington, D. C.

B

Sir:

In the matter of the above entitled application and with reference to Office Letter of January 9, 1922, amendment is hereby made as follows:

Claim 1, line 2, before "split" insert —*cylindrical*—, and after "portion" add —*forming a guide for the piston*—

Claim 2, line 2, after "split" add —*cylindrical*—, and after "portion" add —*forming a guide for the piston*—

Chenard view of Hives (Br.)

Cancel claim 5 and add the following claims:

Insert C^3 B'. Per C Per E Per D

5. A piston comprising a cylindrical ring portion ~~C^3~~ and a guiding skirt portion ~~C^3~~ provided with a slot extending longitudinally across the face thereof and at ~~an~~ a slight angle to the vertical center line of the piston, and a wrist pin bearing integrally connected to said skirt portion.

cls. 5 Sub. C^4

6. A piston comprising a cylindrical portion adapted to engage the walls of a cylinder and provided with a slot extending longitudinally thereof and at an angle to the vertical center line of the piston, and a wrist pin bearing connected to said cylindrical portion.

434467—13

REMARKS

Claims 1 and 2 as amended now bring out applicant's split skirt portion as cylindrical and as forming a guide for the piston. There is clearly a distinction between forming a guiding skirt portion of perforated segments such as Ricardo shows, and in making the same cylindrical and split as applicant does. Ricardo's idea was to make the piston as light as possible and to this end, he uses two separate perforated segments or members. Clearly this reference would not teach applicant's novel idea above referred to. Claim 5 has been cancelled and new claims 5 and 6 substituted therefor. The Examiner's attention is particularly called to the subject matter of these added claims, which it is believed is of an entirely novel and patentable nature in piston construction. The novel feature of applicant's invention as brought out in these claims, consists in the forming of a slot extending longitudinally in a guiding skirt portion of a piston and at an angle to the vertical center line of the piston. The purpose of the slot, of course, is to provide for expansion and contraction and by forming it at an angle to the center line of the piston, applicant avoids wearing a narrow depression in the walls of the cylinder for the reason that in the reciprocation of the piston, this slot will present, with reference to the walls of the cylinder, a relatively broad surface. On the other

hand, if the slot were vertical, reciprocation of the piston would cause the wearing of a narrow groove in the walls of the cylinder. For the foregoing reason, the claims now presented are believed to be directed to clear-

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ly patentable subject matter and early formal allowance of the case is earnestly solicited.

Respectfully submitted,

HOWARD E. MAYNARD,

By: WHITTEMORE, HULBERT & WHITTEMORE,

ADP:G *Attorneys.*

434467—15

(Patent Office May 11, 1922 Mailed)

2—260

Div. 12 Room 322. **Paper No. 6**

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington

May 11, 1922

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a communication from the Examiner in charge of the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467 PISTONS.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Responsive to the amendment of Feb. 2, 1922.

Claims 1 and 2 are again rejected upon Ricardo, of record. Broadly speaking, Ricardo shows a cylindrical split skirt portion for the purpose of guiding the piston in the cylinder. The mere fact that applicant forms his guiding sections to extend over a larger area of the cylinder by reason of the fact that the gap between said sections is narrower than that shown by Ricardo would not involve invention as such a difference is one of degree only.

Claims 5 and 6 are rejected on

Spillman, 1,325,176, Dec. 16, 1919 (74-108-A).

The remaining claims stand allowed.

P. P. PIERCE,

Examiner.

V.I.C.

434467—16

(Mail Room May 29 1922 U. S. Patent Office)

Division 12, **Paper No. 7**
May 31 1922
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

Div. 12, Room 322,
Howard E. Maynard,
Pistons,
Filed Jan. 3, 1921,
Ser. No. 434,467.

Detroit, Michigan, May 25, 1922.

C Hon. Commissioner of Patents,
Washington, D. C.

Sir:—

In the matter of the above entitled application and with reference to Office Letter of May 11, 1922, amendment is hereby made as follows:—

per E C¹	Claim 1, line 2 before —skirt— cancel "split" and after —piston— insert "*and cut away to form a longitudinally extending slit therein.*"
C²	Claim 2, line 2, before —cylindrical— cancel "split" and after —piston— add "*and cut away to form a longitudinally extending slit therein.*"

Claim 5, line 2, after —portion— insert

C³ per E "*separated from each other by a continuous circumferential groove, said skirt being*" and

same line, change —slot— to "*slit*"; line 3, before —thereof— insert "*across the face*" and change —an— to "*a slight.*"

Cancel claim 6 and substitute therefor:—

Cls 5 C⁴ per E 6. A piston comprising a cylindrical ring portion and a substantially cylindrical skirt portion forming a guide for the piston, said portions being separated from each other by a continuous circumferential groove and said skirt portion being provided with a narrow slit extending across one side thereof and at a slight angle to the vertical center line of the piston and integral web portions for connecting said cylindrical portions.

434467—17

Remarks

Claims 1 and 2 respectively have been amended to bring out applicant's cylindrical skirt portion as cut away to form a longitudinal slit therein. It is believed these claims now recite subject matter of a patentable nature differentiating from Ricardo of record, inasmuch as his disclosure would not suggest the forming of a cylindrical skirt portion and cutting the same away to form a longitudinally extending slit therein. The advantage of this feature over the disclosure of the reference is that applicant's skirt portion has a much greater circumferential contact with the walls of the cylinder and consequently practically eliminates any side slapping of the cylinder and at the same time this slit provides for contraction and expansion of said skirt portion. A further advantage in having the greater contacting surface with the cylinder walls is that the skirt will tend to wipe the greater amount of oil therefrom and thus lessen chance of oil passing up past the rings. For these reasons the claims as now presented are believed to be clearly allowable.

Claim 5 has been amended to bring out the cylindrical ring portion and guiding skirt portion as separated from each other by a continuous circumferential

434467—18

groove thus distinguishing from Spillman's disclosure wherein the groove extends only part way around the piston. This claim also brings out that applicant's slit extends across the face at a slight angle to the vertical center line of the piston. The advantage over Spillman's disclosure wherein the slots extend halfway around the piston on opposite sides thereof is that applicant's idea makes for a much stronger piston which will resist the stress thereon much better than the flimsy structure of the reference. Furthermore applicant's device is not only more durable but also provides for contraction and expansion equally as well by this slit which extends only at a slight angle to the vertical center line of the piston. New claim 6 is directed to similar subject matter and in view of the preceding remarks the same is believed to patentably differentiate from the reference.

A more favorable reconsideration and an early formal allowance of the claims now presented is respectfully solicited.

Respectfully submitted,

HOWARD E. MAYNARD,

By WHITTEMORE, HULBERT & WHITTEMORE,

Attorneys.

ADP:AR

434467—19

(Patent Office Jul 13 1922 Mailed)

2—260

Div. 12 Room 322 Paper No. 8

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington July 13, 1922

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Michigan.

Please find below a communication from the EXAMINER in charge of the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467 PISTONS.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Amended May 29, 1922.

Claims 1 and 2 are again rejected upon Ricardo, of record and for the reasons therein stated.

Claims 5 and 6 are rejected upon

Ebbs, 700,309, May 20, 1902 (74-108-A),

in view of Spillman, of record.

In connection with claims 1 and 2 applicant's attention is invited to the fact that the structure shown by Ebbs consists of a piston having a cylindrical ring portion and a cylindrical split skirt portion, said portions being separated by continuous circumferential grooves and said portions being connected together and wrist pin bearings connected to the skirt portions by webs substantially as set forth by applicant.

The remaining claims stand allowed.

P. P. PIERCE,
Examiner.

V.I.C.

434467—20

(Mail Room Aug 16 1922 U. S. Patent Office)
Division 12, Paper No. 9
Aug 17 1922
U. S. Patent Office.
Amendment D

IN THE UNITED STATES PATENT OFFICE

Amendment D
Div. 12, Room 322,
HOWARD E. MAYNARD,
Pistons,
Filed Jan. 3, 1921,
Ser. No. 434,467.

Detroit, Michigan, Aug. 14, 1922.

HON. COMMISSIONER OF PATENTS,
Washington, D. C.

Sir:

In the matter of the above entitled application and with reference to Office Letter of July 13, 1922, amendment is hereby made as follows:

Claim 5, line 5, after —bearing— insert "*integrally*".

Claim 6, line 8, before —web— insert "*integral*".

REMARKS:

The Examiner's ground for rejecting claims 1 and 2 upon Ricardo, is, that broadly speaking he shows a cylindrical split skirt portion for the purpose of guiding the piston in the cylinder. The Examiner further states, that the forming of applicant's guiding sections to extend over a larger area of the cylinder, by reason of the fact that the gap between said sections is narrower than that shown by Ricardo, would not involve invention as such

difference is one of degree only. Applicant respectfully suggests that even broadly considering Ricardo's segments as a split skirt portion although they occupy only one half of the inner circumference of the cylinder, this reference entirely fails to meet the recitation in claims 1 and 2, as now presented, namely, a cylindrical skirt portion forming a guide for the piston and *cut away* to form a longitudinally extending slit therein. There is a decided advantage in applicant's skirt portion construe-

tion over that of Ricardo's firstly in that his greater circumferential contact with the walls of the cylinder eliminates any chance of side slapping of the piston and secondly in that his skirt wipes the greater amount of oil from the cylinder wall thus minimizing the chance for oil to pass the rings. Ricardo's segments engaging substantially only one-half of the surface that applicant's skirt does is devoid of these advantages and certainly would not teach the novel idea of cutting a cylindrical skirt away to form a longitudinally extending slit therein. A more favorable reconsideration and allowance of claims 1 and 2, as now presented, is therefore respectfully requested.

Claim 5 has been amended to recite applicant's wrist pin bearing as integrally connected to his skirt portion obviously differentiating from the Ebbs' disclosure. There is no mention made of the wrist pin bearing in the Spillman disclosure and especially in view of figure 2 it would appear that the bearing shown is not integral.

434467—22

Claim 6 has also been amended to bring out applicant's cylindrical ring and skirt portions as connected by integral web portions as distinguished from Ebbs' construction wherein the rim portion is secured to the skirt portion by a detachable member d. Claim 6 which also recites applicant's slit extending across the face of the piston at a slight angle to the vertical center line of the piston is believed to recite subject matter patentably differentiating from the Spillman disclosure. Spillman's slits which extend half way around his piston on opposite sides thereof necessitates spot welding of the pointed end of the tongues and then grinding of the same down to a true cylinder. (See lines 4 to 15 inclusive page 2). Applicant's novel idea avoids this requirement and furthermore makes for a stronger and more durable piston at the same time possessing the desired advantages. It is believed the claims, as now submitted, are therefore drawn to patentable subject matter and an early formal allowance of the case is earnestly solicited.

Respectfully submitted,

HOWARD E. MAYNARD,

By: WHITTEMORE, HULBERT & WHITTEMORE,

Attorneys.

ADP:AR

434467—23

(Patent Office Oct 5-1922 Mailed)

2—260

Div. 12 Room 322 **Paper No. 10**

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

Ch-D Washington Oct. 5, 1922

Whittemore, Hulbert & Whitemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a communication from the Examiner in charge of the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467 Pistons.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Responsive to the amendment of Aug. 16, 1922.

Claims 1 and 2 are rejected as setting forth an unpatentable combination over Ebbs in view of Ricardo, both of record.

Relative to the above claims, applicant's attention is invited to the following considerations: the Ebbs structure discloses all of the basic structural features and combinations set forth by these claims, namely, in that it shows a piston comprising cylindrical ring and skirt portions, separated from each other by a continuous annular slot passing completely therethru, said skirt "being longitudinally slit and "web" portions" connecting the head and skirt and the wrist pin bearing being integral with the said "web". The additional limitations of "the webs being attached to the skirt only at their opposite vertical edges" and the statements to the effect that there are two wrist pin bearings, are shown to be old in the art by Ricardo, who includes these features in the same combination of features.

It is further to be noted that applicant's contribution to the art resides in the provision of an annular portion at the lower part of the piston skirt below the ex-

434467—24

434,467—2

posed gudgeon pin bosses. That is, in casting the guide slippers of Ricardo continuous below the webs and wrist pin bosses and then splitting the skirt on the thrust side. This feature forms the basis of patentability in the allowed claims, which are thought to completely cover applicant's invention.

Claims 5 and 6 are rejected on the

French patent to Chenard *et al.*, 468,595, Apr. 28, 1914 (74-108) (1 sheet),

in view of either

Schoengarth, 1,174,092, Mar. 7, 1916 (74-108-A),

or the

British patent to Hives *et al.*, 140,988, Apr. 8, 1920 (74-108-A) (1 sheet).

There being no invention in splitting the piston skirt shown by the French patent, *supra*, in the manner taught by the last named patents.

Upon viewing the allowed claims it is noted that "the segments of said skirt" referred to in claim 3 has no antecedent. This phrase is also held to be inaccurate, unwarranted and not applicable to the device disclosed and described by applicant. Applicant's piston skirt is an integral unitary structure and not divided into segments.

The above observations are equally applicable to the similar terms occurring in claim 4. In order that the prosecution of the case may be expedited without unnecessary delay, the examiner suggests that "segments of", in line 8, claim 3, should be canceled. Also in claim 4, lines 10 and 11 "segmental portions of", and "extending therebetween," respectively should be canceled. Same claim, line 12, "segmental portions," should be canceled and *webs* inserted in lieu thereof.

P. P. Pierce,
Examiner.

V.I.C.

434467—25

8449

(Mail Room Mar 19 1923 U. S. Patent Office)

Division 12, Paper No. 11
Mar 20 1928
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

Div. 12, Room 322,
Howard E. Maynard,
Pistons,
Filed Jan. 3, 1921,
Serial No. 434,467.

Detroit, Mich., March 16, 1923.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:—

In the matter of the above entitled application and with reference to Office Letter of October 5, 1922, amendment is hereby made as follows:—

Cancel claims 1 and 2.

Claim 3, line 8, cancel "segments of."

Claim 4, line 10, cancel "segmental portions of." Lines 10 and 11, cancel "extending therebetween." Line 12, cancel "segmental portions" and substitute —*webs*—.

Cancel claims 5 and 6.

Adjust the ordinals of the remaining claims and add:—

3. A piston comprising a head, a cylindrical skirt beneath said head and having recesses in diametrically opposite sides thereof, webs extending downwardly from said head upon diametrically opposite sides thereof and having the opposite side edges thereof connected to the side edges of the recesses in said skirt, whereby openings are provided

434467—26

8450

between the lower ends of said webs and said skirt, and wrist pin bearings carried by said webs.

4. 3 A piston comprising a head, a cylindrical skirt beneath said head having recesses in diametrically opposite sides thereof, parallel webs extending downwardly

from said head and having the opposite side edges thereof connected to the side edges of the recesses in
Per I said skirt, ~~whereby~~ **separating** openings ~~are~~ **being** provided between the lower ends of said webs and said skirt and between the upper edges of said skirt and said head, and wrist pin bearings carried by said webs.

5. A piston comprising a head, a cylindrical skirt beneath said head having recesses in diametrically opposite sides thereof, webs extending downwardly from said head and having the opposite side edges thereof connected to the side edges of the recesses in
Per I said skirt, whereby openings are provided between the lower ends of said webs and said skirt, and wrist pin bearings formed integral with said webs, one side of said skirt between the points of attachment of said webs thereto being slit longitudinally.

6. 4 A piston comprising a head having a depending cylindrical portion provided with annular grooves, rings engaging said grooves, the cylindrical portion below the lowermost ring being cut away, a cylindrical skirt beneath the cylindrical portion of said head and having recesses in diametrically opposite sides thereof, webs extending downwardly from said head and having the opposite side edges thereof connected to the side
Per I edges of the recesses in said skirt, ~~whereby~~ sep-
" I arating openings ~~are~~ being provided between the lower ends of said webs and said skirt, and wrist pin bearings carried by said webs, one side of said

skirt between the points of attachment of said webs thereto being slit longitudinally.

7. 5 A piston comprising a head, a cylindrical skirt beneath said head, parallel webs extending downwardly from said head and connected to said skirt
Per I ~~whereby~~ **separating** recesses ~~are~~ **being** provided between the lower ends of said webs and said skirt and between the upper ends of said skirt and said head, one side of said skirt between the points of attachment of said webs thereto being slitted longitudinally, and wrist pin bearings carried by said webs. **(X)**

REMARKS

Claims 1 and 3 (former claims 3 and 4) have been amended in accordance with the suggestions of the Examiner.

The references of record fail to show a cylindrical skirt beneath a piston head having recesses in diametrically opposite sides thereof together with webs extending downwardly from the piston head and having the opposite side edges thereof connected to the side edges of the recesses in said skirt, whereby openings are provided between the lower ends of said webs and said skirt as well as between the upper edges of said skirt and said head. This construction is defined in the new claims submitted above. The references of record also fail to show a head having a depending cylindrical portion provided with annular grooves adapted to receive the piston rings, said cylindrical portion below the lowermost ring being cut away.

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8452

In the absence of more pertinent art, an early allowance is most respectfully requested.

Respectfully submitted,

HOWARD E. MAYNARD,

By WHITTEMORE, HULBERT & WHITTEMORE,

ARW/ej *Attorneys.*

434467—29

(Patent Office Apr 5 1923 Mailed).

2—260

Div. 12 Room 322 Paper No. 12

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington April 5, 1923

Copy sent applicant.

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a communication from the EXAMINER in charge of the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467 Pistons.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Amended March 19, 1923.

The following claims are suggested to the applicant for the purpose of interference:

—A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.

A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction and the skirt portion being cut away adjacent the outer ends of the piston bosses.

A piston having a head portion with a ring groove therein, a skirt portion having its cylinder engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on

both sides of the bosses and with the head portion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and

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contraction of the skirt portion.

A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being co-operably connected at their opposite ends to said cylinder engaging portion.

A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

A piston closed at one end and open at its opposite end, said piston having an annular cutting formed through the thickness of its peripheral wall thereby providing a separated sleeve-like skirt which is approximately cylinder bearing in its entirety, a pair of wrist pin bearings depended from said piston end and being

free from engagement with said skirt, supporting means extending from each of said bearings to said skirt, said skirt being provided with a longitudinal slot cut through the thickness of its wall and extending from the open end thereof to said annular cutting.

In a piston for an internal combustion engine, the combination of a head having ring grooves therein, a plurality of webs integral with said head and having diametrically opposite piston pin bosses therein, a skirt integral with said webs relieved adjacent said webs and separated from the head by circumferential slots and provided with a longitudinal slot connecting the lower end of the piston with one of the circumferential slots.

In a piston for an internal combustion engine the combination of a head comprising a head disc and a peripheral flange having ring grooves therein, a pair of

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cordal webs, substantially rectangular in shape and located opposite each other in the piston, connected integrally at their upper edges to the peripheral flange of the piston, diametrically opposite wrist pin bosses, one in each of said webs, a skirt for said piston integrally connected to each of the side edges of the webs and cut away so as to expose each of the rectangular webs and the piston pin bosses from the outside of the piston, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston.

Failure to make the above claims within thirty days from the date of mailing of this letter will be taken as a disclaimer of the subject matter covered thereby.

R. M. WEAVER,
Acting Examiner, Div. 12.

V.I.C.

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(Mail Room Apr 23 1923 U. S. Patent Office)

Division 12, Paper No. 13.
Apr 24 1923
U. S. Patent Office

IN THE UNITED STATES PATENT OFFICE

Div. 12, Room 322,
Howard E. Maynard,
Pistons,
Filed Jan. 3, 1921,
Serial No. 434,467.

Detroit, Mich., April 21-1923.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:—

In the matter of the above entitled application and with reference to Office Letter of April 5, 1923, amendment is hereby made as follows:—

Add the following claims:—

Per H 8. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split F' longitudinally at one side between its connections to said bosses.

9. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

10. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the

zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except

through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction and the skirt portion being cut away adjacent the outer ends of the piston bosses.

11. A piston having a head portion with a ring groove therein, a skirt portion having its cylinder engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

12. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

13. A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

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14. A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion and separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being cooperably connected at their opposite ends to said cylinder engaging portion.

15. A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging

parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

16. A piston closed at one end and open at its opposite end, said piston having an annular cutting formed through the thickness of its peripheral wall thereby providing a separated sleeve-like skirt which is approximately cylinder bearing in its entirety, a pair of wrist pin bearings depended from said piston end and being free from engagement with said skirt, supporting means extending from each of said bearings to said skirt, said skirt being provided with a longitudinal slot cut through the thickness of its wall and extending from the open end thereof to said annular cutting.

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17. In a piston for an internal combustion engine, the combination of a head having ring grooves therein, a plurality of webs integral with said head and having diametrically opposite piston bosses therein, a skirt integral with said webs relieved adjacent said webs and separated from the head by circumferential slots and provided with a longitudinal slot connecting the lower end of the piston with one of the circumferential slots.

18. In a piston for an internal combustion engine the combination of a head comprising a head disc and a peripheral flange having ring grooves therein, a pair of cordal webs, substantially rectangular in shape and located opposite each other in the piston, connected integrally at their upper edges to the peripheral flange of the piston, diametrically opposite wrist pin bosses, one in each of said webs, a skirt for said piston integrally connected to each of the side edges of the webs and cut away so as to expose each of the rectangular webs and the piston pin bosses from the outside of the piston, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston.

Insert G'

REMARKS

The above claims have been added for the purpose of interference.

Respectfully submitted,

HOWARD E. MAYNARD,

By WHITTEMORE, HULBERT & WHITTEMORE,

Attorneys.

ARW/ej

434467—36

2—079

INTERFERENCE "A" (1)

Interference No. 49569 Paper No. 14
Name, Howard E. Maynard,
Serial No. 434,467
Title, Pistons
Filed, Jan. 3, 1921
Interference with R. E. Day; G. A. Taylor; S. D. Hartog; E. C. Long; Frank Jardine and E. J. Gulick.

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	Adverse	Dated, June 2/24.
Board,		Dated,
Commissioner,		Dated,

REMARKS:

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This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—37

(U. S. Patent Office Jul 7 1923 Mailed)

Forwarded from 12 Div. to Examiner of Interferences June 15, 1923.

Paper No. ~~14~~ 15
[INTERFERENCE.]
"A" (1)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a copy of a communication from the Examiner concerning the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467, Pistons.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49569

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

The interference involves your application above identified and an application for Pistons, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for Pistons, filed by George A. Taylor, of 164 Dana Avenue, Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland and Dike, of Tremont Bldg., Boston, Mass.,

An application for Pistons, filed by Frank Jardine, of c/o The Aluminum Castings Co., Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East

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9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures Inc., Cleveland, Ohio,

An application for Pistons, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Missouri, whose attorney is Bippey and Kingsland, of The Rialto Bldg., St. Louis, Mo.,

An application for Internal Combustion Engine Pistons, filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, whose attorney is Herbert G. Fletcher, of 321 International Life Bldg., c/o Knight Bros., St. Louis, Mo., and

An application for Pistons, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, c/o Packard Motor Car Co., Detroit, Michigan, and whose assignee is the Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Hartog	Jardine	Long	Maynard	Taylor
1	14	15	30	15	10	12	13.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

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2—079

INTERFERENCE. "B" (2)

Interference No. 49570 Paper No. 16
Name, Howard E. Maynard
Serial No. 434,467
Title, Pistons
Filed, Jan. 3, 1921
Interference with R. E. Day; G. A. Taylor; E. C. Long; F. Jardine, E. J. Gulick; and S. D. Hartog.

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	Adverse	Dated, Apr. 8/24.
Board,		Dated,
Commissioner,		Dated,

REMARKS:

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.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—40

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences. June 15, 1923 Ch-D

Paper No. 17
[INTERFERENCE.]
"B" (2)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467, PISTONS

Very respectfully,
THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322
Address only
The Commissioner of Patents
Washington, D. C.

49570

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Washington, whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Illinois,

An application for Pistons, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for Piston for an Internal Combustion Engine, filed by Elmer C. Long, of 4834 Beaubien St., Detroit, Michigan, whose attorney is Herbert G. Fletcher, of 1111 International Life Bldg., St. Louis, Missouri,

434467—41

434,467—2

An application for Pistons, filed by Frank Jardine, of c/o The Aluminum Castings Co., Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures Inc., of Cleveland, Ohio,

An application for Pistons, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Missouri, whose attorney is Rippey & Kingsland, of The Rialto Bldg., St. Louis, Missouri, and

An application for Pistons, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, of c/o Packard Motor Car Company, Detroit, Michigan, and whose assignee is The Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Hartog	Jardine	Long	Maynard	Taylor
1	15	30	1	16	13	13	14.

P. P. Pierce,
Examiner, Div. 12.

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V.I.C.

2—079

INTERFERENCE.

"C" (3)
Paper No. 18

Interference No. 49571
Name, Howard E. Maynard,
Serial No. 434,467
Title, PISTONS
Filed, Jan. 3, 1921
Interference with R. E. Day; G. A. Taylor; A. Spillman, F. Jardine; E. C. Long; E. J. Gulick (Kelm added).

DECISIONS OF

Primary Examiner,	Dated,
Ex'r of Interferences, **Adverse**	Dated, **June 2/24.**
Board,	Dated,
Commissioner,	Dated,

REMARKS:

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This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—43

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 19
[INTERFERENCE.]
"C" (3)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C,

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a copy of a communication from the Examiner concerning the application of Howard E.

Maynard, Filed Jan. 3, 1921, Serial No. 434,467, PISTONS.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49571

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug 27 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion and separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being co-operably connected at their opposite ends to said cylinder engaging portion.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for PISTONS, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for ENGINE PISTONS, filed by Albert Spillman, of 261 Payne Ave., North Tonawanda, New York, whose attorney is Geyer & Popp, of 619 Brisbane Bldg., Buffalo, N. Y.,

434,467—2

An application for PISTONS, filed by Frank Jardine, of c/o The Aluminum Castings Company, Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures Inc., of Cleveland, Ohio;

An application for PISTON, filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, whose attorney is Herbert G. Fletcher, of International Life Bldg., St. Louis, Missouri, and

An application for PISTONS, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, of c/o Packard Motor Car Company, Detroit, Michigan, whose assignee is the Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Jardine	Long	Maynard	Spillman	Taylor
1	16	31	17	1	14	13	15.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

434467—45

2—079

INTERFERENCE.

"D" (4)
Paper No. 20

Interference No. 49572
Name, Howard E. Maynard.
Serial No. 434,467
Title, PISTONS
Filed, Jan. 3, 1921.
Interference with E. J. Gulick; E. C. Long; S. D. Hartog; F. Jardine; A. Spillman and G. A. Taylor.

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	Adverse	Dated, Apr. 10/24
Board,		Dated,
Commissioner,		Dated,

REMARKS:

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This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—46

(U. S. Patent Office Jul 7-1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences. June 15, 1923

Paper No. 21
[INTERFERENCE.]
"D" (4)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Whittemore, Hulbert, & Whittemore,
Penobscot Bldg.,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of HOWARD E. MAYNARD, Filed Jan. 3, 1921, Serial No. 434,467, PISTONS.

Very respectfully,
THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49572

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston having a head with top and side walls in combination with a guide structure connected there-

to and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

This interference involves your application above identified and an application for PISTONS, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for ENGINE PISTONS, filed by Albert Spillman, of 261 Payne Ave., North Tonawanda, N. Y., whose attorney is Geyer and Popp, of 619 Brisbane Bldg., Buffalo, N. Y.,

An application for PISTONS, filed by Frank Jardine, of c/o the Aluminum Castings Co., Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures Inc., of Cleveland, Ohio,

434467—47

434,467—2

An application for PISTONS, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Mo., whose attorney is Rippey and Kingsland, of The Rialto Bldg., St. Louis, Mo.,

An application for PISTONS FOR INTERNAL COMBUSTION MOTORS, filed by Elmer C. Long, of 1037 Main St., Quincy, Illinois, whose attorney is Herbert G. Fletcher, of c/o Knight Bros., 321 International Life Bldg., St. Louis, Mo., and

An application for PISTONS, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, of c/o Packard Motor Car Company, Detroit, Michigan, and whose assignee is the Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Gulick	Hartog	Jardine	Long	Maynard	Spillman	Taylor
1	32	24	20	7	15	16	16.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

434467—48

2—079

INTERFERENCE.

44E22 (5)

Interference No. 49573 Paper No. 22
Name, Howard E. Maynard,
Serial No. 434,467
Title, Pistons
Filed, Jan. 3, 1921
Interference with E. J. Gulick; E. C. Long; S. D. Hartog; F. Jardine R. E. Day

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	Adverse	Dated, Apr. 10/24
Board,		Dated,
Commissioner,		Dated,

REMARKS:

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.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—49

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 23
[INTERFERENCE.]
44E22 (5)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a copy of a communication from the Examiner concerning the application of Howard

E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467
Pistons.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49573

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

I. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.

This interference involves your application above identified and an application for Pistons, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for Pistons, filed by Frank Jardine, of c/o Aluminum Castings Company, Cleveland, Ohio, and whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures, Inc., Cleveland, Ohio,

An application for Pistons, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Mo., whose attorney is Rippey and Kingsland, of The Rialto Bldg., St. Louis, Missouri.

434467—50

434,467—2

An application for Internal Combustion Engine Pistons filed by Elmer C. Long, of 1037 Main St., Quincy,

Illinois, whose attorney is Herbert G. Fletcher, of 321 International Life Bldg., c/o Knight Bros., St. Louis, Mo., and

An application for PISTONS, filed by Edward J. Gulick of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, of c/o Packard Motor Car Co., Detroit, Mich., and whose assignee is the Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Hartog	Jardine	Long	Maynard
1	10	1	28	12	8	8.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

434467—51

2—079

INTERFERENCE.

"F" (6)

Interference No. 49574 Paper No. 24
Name, Howard E. Maynard,
Serial No. 434,467
Title, PISTONS
Filed, Jan. 3, 1921
Interference with E. J. Gulick; S. D. Hartog; E. C. Long; G. A. Taylor and R. E. Day

DECISIONS OF

~~Primary~~ Law Examiner, Interference dissolved	Dated, Apr 4 1924
Ex'r of Interferences,	Dated,
Board,	Dated,
Commissioner,	Dated,

REMARKS:

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.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—52

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 25
[INTERFERENCE.]
"F" (6)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE

Washington, D. C.

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a copy of a communication from the Examiner concerning the application of Heward E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467, PISTONS.

Very respectfully,
THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49574

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston closed at one end and open at its opposite end, said piston having an annular cutting formed through the thickness of its peripheral wall thereby providing a separated sleeve-like skirt which is approximately cylinder bearing in its entirety, a pair of wrist pin bearings depended from said piston end and being free from engagement with said skirt, supporting means extending from each of said bearings to said skirt, said

skirt being provided with a longitudinal slot cut through the thickness of its wall and extending from the open end thereof to said annular cutting.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for PISTONS, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for PISTONS, filed by Elmer C. Long, of 4834 Beaubien St., Detroit, Michigan, whose attorney is Herbert G. Fletcher, of International Life Bldg., St. Louis, Mo.,

434467—53

434,467—2

An application for PISTONS, filed by Stephen D. Hartog, of 3219 Natural Bridge Ave., St. Louis, Mo., and whose attorney is Rippey and Kingsland, of The Rialto Bldg., St. Louis, Mo., and

An application for PISTONS, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, of c/o Packard Motor Car Company, Detroit, Mich., whose assignee is The Cleveland Trust Co., of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Hartog	Long	Maynard	Taylor
1	18	33	32	1	16	18.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

434467—54

2—079

INTERFERENCE.

11G^{22} (7)

Interference No. 49575 Paper No. 26
Name, Howard E. Maynard,
Serial No. 434,467
Title, PISTONS
Filed, Jan. 3, 1921
Interference with E. J. Gulick; E. C. Long; G. A. Taylor;

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	Adverse	Dated, Apr. 8/24
Board,		Dated,
Commissioner,		Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—55

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 27
[INTERFERENCE.]
"G" (7)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a copy of a communication from the Examiner concerning the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467 PISTONS.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322
Address only
The Commissioner of Patents
Washington, D. C.

49575

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., and whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for PISTONS, filed by George A. Taylor, of 164 Dana Ave., Hyde Park, Mass., and whose attorney is Macleod, Calver, Copeland & Dike, of Tremont Bldg., Boston, Mass.,

An application for PISTON FOR AN INTERNAL COMBUSTION ENGINE, filed by Elmer C. Long, of 4834 Beaubien St., Detroit, Mich., and whose attorney is Herbert G. Fletcher, of 1111 International Life Bldg., St. Louis, Mo., and

434467—56

434,467—2

An application for PISTONS, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, of c/o Packard Motor Car Company, Detroit, Michigan, and whose assignee is the Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Long	Maynard	Taylor
1	13	13	12	11	12.

P. P. PIERCE,

V.I.C. *Examiner, Div. 12.*

434467—57

2—079

INTERFERENCE.

"H" (8)
Paper No. 28

Interference No. 49576
Name, Howard E. Maynard
Serial No. 434,467
Title, PISTONS
Filed, Jan. 3, 1921
Interference with E. J. Gulick; E. C. Long; F. Jardine; R. E. Day

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	**Adverse**	Dated, **Apr. 10/24**
Board,		Dated,
Commissioner,		Dated,

REMARKS:

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.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—58

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 29
[INTERFERENCE.]
"H" (8)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467, PISTONS.

Very respectfully,

THOMAS E. ROBERTSON,

Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49576

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction and the skirt portion being cut away adjacent the outer ends of the piston bosses.

This interference involves your application above identified and an application for Pistons, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., and whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for Pistons, filed by Frank Jardine, of c/o The Aluminum Castings Co., Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures, Inc., of Cleveland, Ohio,

434467—59

434,467—2

An application for Pistons, filed by Elmer C. Long, of 4834 Beaubien St., Detroit, Mich., and whose attorney is Herbert G. Fletcher, of International Life Bldg., St. Louis, Mo., and

An application for Pistons, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Ind., and whose attorney is Milton Tibbetts, of c/o The Packard Motor Car Co., Detroit, Mich., and whose assignee is The Cleveland

Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Jardine	Long	Maynard
1	12	12	14	11	10.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

434467—60

2—079

INTERFERENCE.

"I" (9)
Paper No. 30

Interference No. 49577
Name, Howard E. Maynard,
Serial No. 434,467
Title, PISTONS
Filed, Jan. 3, 1921
Interference with E. J. Gulick; E. C. Long; F. Jardine & R. E. Day

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	Adverse	Dated, Dec 20, 1923
Board,		Dated,
Commissioner,		Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—61

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 31
[INTERFERENCE.]
~~41~~ (9)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a copy of a communication from the Examiner concerning the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467, PISTONS.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49577

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., and whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill.,

An application for PISTONS, filed by Frank Jardine, of c/o The Aluminum Castings Company, Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures, Inc., of Cleveland, Ohio,

An application for INTERNAL COMBUSTION ENGINE

434467—62

434,467—2

PISTONS, filed by Elmer C. Long, of 1037 Main St., Quincy, Ill., whose attorney is Herbert G. Fletcher, of 321 International Life Bldg., c/o Knight Bros., St. Louis, Mo., and

An application for PISTONS, filed by Edward J. Gulick, of P. O. Box 553, Elkhart, Indiana, whose attorney is Milton Tibbetts, of c/o Packard Motor Car Company, Detroit, Mich., and whose assignee is the Cleveland Trust Company, of Cleveland, Ohio, a corporation of Ohio.

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Gulick	Jardine	Long	Maynard
1	11	11	13	9	9.

P. P. PIERCE,
Examiner, Div. 12

V.I.C.

434467—63

2—079

INTERFERENCE.

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(14)
Paper No. 32

Interference No. 49582
Name, Howard E. Maynard
Serial No. 434,467
Title, PISTONS
Filed, Jan. 3, 1921
Interference with F. Jardine; R. E. Day

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	Adverse	Dated, Nov 19/23.
Board,		Dated,
Commissioner,		Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—64

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 33
[INTERFERENCE.]
JAN22 (14)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Michigan.

Please find below a copy of a communication from the Examiner concerning the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467, PISTONS.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49582

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. In a piston for an internal combustion engine, the combination of a head having ring grooves therein, a plurality of webs integral with said head and having diametrically opposite piston pin bosses therein, a skirt integral with said webs relieved adjacent said webs and separated from the head by circumferential slots and provided with a longitudinal slot connecting the lower end of the piston with one of the circumferential slots.

This interference involves your application above identified and an application for PISTONS, filed by Ray E. Day, of 3825 North 24th St., Tacoma, Wash., and whose attorney is Clarence E. Mehlhope, of Marquette Bldg., Chicago, Ill., and

An application for PISTONS, filed by Frank Jardine, of c/o Aluminum Castings Co., Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures, Inc., of Cleveland, Ohio.

434467—65

434,467—2

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Day	Jardine	Maynard
1	19	3	17.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

434467—66

2—079

INTERFERENCE.

"U"

Interference No. 49589 Paper No. 34
Name Howard E. Maynard
Serial No. 434,467
Title, PISTONS
Filed, Jan. 3, 1921
Interference with Frank Jardine

DECISIONS OF

Primary Examiner,		Dated,
Ex'r of Interferences,	**Adverse**	Dated, **Nov 19/23**
Board,		Dated,
Commissioner,		Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—67

(U. S. Patent Office Jul 7 1923 Mailed)

2—213

Forwarded from 12 Div. to Examiner of Interferences.
June 15, 1923
Ch-D

Paper No. 35
[INTERFERENCE.]
"U"

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington, D. C.

Whittemore, Hulbert & Whittemore,
Penobscot Bldg.,
Detroit, Mich.

Please find below a copy of a communication from the Examiner concerning the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467, PISTONS.

Very respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

Room No. 322

Address only
The Commissioner of Patents
Washington, D. C.

49589

The case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before Aug. 27, 1923, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count.

1. In a piston for an internal combustion engine the combination of a head comprising a head disc and a peripheral flange having ring grooves therein, a pair of cordal webs, substantially rectangular in shape and located opposite each other in the piston, connected integrally at their upper edges to the peripheral flange of the piston, diametrically opposite wrist pin bosses, one in each of said webs, a skirt for said piston integrally connected to each of the side edges of the webs and cut away so as to expose each of the rectangular webs and the piston pin bosses from the outside of the piston, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston.

This interference involves your application above identified and an application for PISTONS, filed by Frank Jardine, of c/o Aluminum Castings Co., Cleveland, Ohio, whose attorney is B. D. Watts, of 451 Lennox Bldg., East 9th & Euclid Ave., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures, Inc., of Cleveland, Ohio.

434467—68

434,467—2

The relation of the count of the interference to the claims of the respective parties is as follows:

Count	Jardine	Maynard
1	6	18.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

434467—69

(Docket Division Sep 5 1923 U. S. Patent Office)
(Mail Room Sep 4 1923 U. S. Patent Office)
(U. S. I. R. Documentary Stamp 25 Cents)

Case in Interference 434,467
Division 12, Paper No. 36
Sep 5 1923
U. S. Patent Office

WHITTEMORE, HULBERT, WHITTEMORE & BELKNAP
Suite 1112 Penobscot Building
Detroit, Mich. August 31, 1923.

Hon. Commissioner of Patents,
Washington, D. C.
Sir—

In the matter of application for patent of Howard E. Maynard entitled Improvements in Pistons, serial number 434,467, filed January 3, 1921, now involved in interference proceedings numbered 49569 to 49577 inclusive and 49582 and 49589,—please recognize Mr. J. King Harness, of Suite 1211 Majestic Building, Detroit, Wayne County, Michigan, as our associate in the further prosecution of said application and interference proceedings involving same, and address all future communications in either matter to him at his address above given.

Very respectfully,

Whittemore, Hulbert & Whittemore,
Attorneys of record for Maynard.

JPB

434467—70

(U. S. Patent Office Dec 3 1923 Mailed)

2—260

Div. 12 Room 322 Paper No. 37

Address only
"The Commissioner of Patents,
Washington, D. C."
and not any official by name.

All communications respecting this application should give the serial number date of filing, title of invention, and name of the applicant.

Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington

J. King Harness,
1211 Majestic Bldg.,
Detroit, Michigan.

Please find below a communication from the EXAMINER in charge of the application of Howard E. Maynard, Filed Jan. 3, 1921, Serial No. 434,467—PISTONS.

THOMAS E. ROBERTSON,
Commissioner of Patents.

49571

In accordance with the provisions of Rule 129, the application for patent filed by Gustav R. Kelm, whose post-office address is 417 East 23rd Street, New York, New York, whose attorney is Clarence D. Kerr, of No. 5 Nassau Street, New York, New York, and whose assignee is the Walker N. Levett Company of New York, New York, is hereby added to Interference No. 49571, between Day v. Taylor v. Spillman v. Maynard v. Jardine v. Long v. Gulick to which you are a party. The claim of Kelm's application corresponding to the count of the issue is:

Count	Claim
1	7.

The new party only is given until the ....., day of ..... 19....., within which to file the preliminary statement required by Rule 110.

The issue of the interference remains unchanged.

P. P. PRINCE,
Examiner, Div. 12.

V.I.C.

434467—71

(U. S. Patent Office Dec 3 1923 Mailed)

2—260

Div. 12 Room 322 Paper No. 38

Address only,
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

Ch-D

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington

J. King Harness,
1211 Majestic Bldg.,
Detroit, Michigan.

Please find below a communication from the Examiner in charge of the application of Howard E. Maynard, filed Jan. 3, 1921, Serial No. 434,467, Pistons.

THOMAS E. ROBERTSON,
Commissioner of Patents.

49572

In accordance with the provisions of Rule 129, the application for patent filed by Gustav R. Kelm, whose post-office address is 417 East 23rd St., New York, New York, whose attorney is Clarence D. Kerr, of #5 Nassau Street, New York, New York, and whose assignee is the Walker M. Levett Company, of New York, New York, a corporation of New York, is hereby added to interference No. 49572, between Taylor v. Spillman v. Maynard v. Jardine v. Hartog v. Long v. Gulick, to which you are a party. The claim of Kelm's application corresponding to the count of the issue is:

Count	Claim
1	8.

The new party only is given until the Dec 31 1923, day of ....., 19.., within which to file the preliminary statement required by Rule 110.

The issue of the interference remains unchanged.

P. P. PIERCE,
Examiner, Div. 12.

V.I.C.

434467—72

(Mailed Mar 23 1926)

2—260

Div. 12 Room 380 **Paper No. 39**

Address only,
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, and name of the applicant.

Custer-J

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
Washington March 23, 1926

Please find below a communication from the Examiner in charge of this application.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Applicant: Howard E. Maynard
Ser. No. 434,467
Filed Jan. 3, 1921
For Pistons

J. King Harness,
1211 Majestic Bldg.,
Detroit, Mich.

The following patent is added to the record:

Derby et al, 1,053,790, Feb. 18, 1913 (74-108-9)

Interference Nos. 49,573; 49,577; 49,576; 49,575; 49,569; 49,570; 49,571; 49,572; 49,582; and 49,589 in which this application was involved having terminated adversely to applicant, claims 8 to 15 inclusive, 17 and 18 constituting the issues thereof stand finally rejected in accordance with Rule 132.

Interference No. 49572 having been dissolved on Spillman et al and Ebbs of record together with Derby et al, cited, claim 16 stands rejected in accordance with the decision noted in connection with this interference.

The remaining claims are all rejected as setting forth nothing patentable over the various issues of the numerous interferences.

P. P. PIERCE,
Examiner.

GYC

434467—73

(Mailed Jun 11 1926)

2—260

Div. 12 Room 380 Paper No. 40

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name.

All communications respecting this application should give the serial number, date of filing, and name of the applicant.

Pi-J Copy sent applicant

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE

Washington June 11, 1926

Please find below a communication from the Examiner in charge of this application.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Applicant: Howard E. Maynard
Ser. No. 434,467
Filed Jan. 3, 1921
For Pistons

J. King Harness,
1211 Majestic Bldg.,
Detroit, Michigan.

The following claims are suggested to the applicant for the purpose of interferences:

—In a piston for an internal combustion engine, the combination of a head, a plurality of webs integral with said head and having oppositely disposed wrist pin bosses mounted one in each web, a skirt integral with said webs relieved adjacent said webs to a point between the bosses and the end of the skirt, said piston being provided with circumferential slots between the piston

head and skirt and with a longitudinal slot connecting the open end of the skirt with one of the circumferential slots.

In a piston for an internal combustion engine, the combination of a head and a plurality of webs integral with said head, diametrically oppositely disposed wrist pin bosses, one mounted in each of said webs and integral therewith, a skirt integral with said webs, relieved adjacent said webs, said relieved portion terminating between the bosses and the end of the skirt, said piston being provided with circumferential slots between the piston head and skirt, with a longitudinal slot connecting the end of the skirt with one of said circumferential slots, and with other circumferential slots between the end of the webs and the open end of the skirt.

In a piston for an internal combustion engine, the combination of a head provided with a disc portion and a flange portion and with ring grooves in the flange portion, a pair of substantially rectangular shaped webs integral with and depending from the flange portion of the head, a pair of oppositely disposed wrist pin bosses mounted one in each of said webs, a cross rib in said head and integral with the disc portion and flanges of the head and with said web and piston pin bosses, a skirt for said piston extending below said webs and integrally connected to the side edges of each of said webs, said piston being provided with circumferential slots between the skirt and head, with a longitudinal slot connecting one of said circumferential slots with the bottom edge of the skirt and with circumferential slots between the lower edges of the webs and the adjacent portion of the skirt.

A piston for an internal combustion engine comprising a head, oppositely disposed walls depending from and connected at their upper ends to the head, bosses carried by the said walls out of direct contact with the head, and a skirt structure including two oppositely disposed bearing portions joined together by extensions below each of the said bosses and indirectly connected to the head by the said walls, the skirt structure being separated, by air gaps, from the head at its upper edge, and from the said walls below the bosses.

434467—74

434,467—2

A piston for an internal combustion engine comprising a head, oppositely disposed walls depending from and connected at their upper ends to the head, the walls

being depressed within the maximum diameter of the piston, bosses carried by the said walls out of direct contact with the head, and a skirt structure, including two oppositely disposed bearing portions joined together by extensions below each of the said bosses and indirectly connected to the head by the said walls, the skirt structure being separated, by air gaps, from the head at its upper edge, and from the said walls below the bosses.—

A piston for an internal combustion engine comprising an integral head and skirt, the said skirt consisting of oppositely disposed cylinder engaging bearing walls separated from the head by circumferential slots, a slot extending lengthwise of one of the said bearing walls, depressed walls connecting the said bearing walls, and other cylinder engaging walls connecting the first said bearing walls and separated from the said depressed walls by circumferential slots.—

Failure to make the above claims within thirty days from the date of mailing of this letter will be taken as a disclaimer of the subject matter covered thereby.

P. P. Pierce,
Examiner.
434467—75

8453

(Mail Room Jun 24 1926 U. S. Patent Office)

U. S. Patent Office
Jun 25 1926
Division 12, Paper No. 41

IN THE UNITED STATES PATENT OFFICE

Div. 12, Room 380
Howard E. Maynard
Pistons
Serial No. 434,467
Filed Jan. 3, 1921
} Amendment.

Commissioner of Patents,
Washington, D. C.

Sir:—In response to Office Action of June 11th, 1926.

Please add the following claims:

~~19G.~~ 6 "In a piston for an internal combustion engine, the combination of a head, a plurality of webs integral with said head and

Per K

G[1] ___ having oppositely disposed wrist pin bosses mounted one in each web, a skirt integral with said webs relieved adjacent said webs to a point between the bosses and the end of the skirt, said piston being provided with circumferential slots between the piston head and skirt and with a longitudinal slot connecting the open end of the skirt with one of the circumferential slots.

20C 7 In a piston for an internal combustion engine, the combination of a head and a plurality of webs integral with said head, diametrically oppositely disposed wrist pin bosses, one mounted in each of said webs and integral therewith, a skirt integral with said webs, relieved adjacent said webs, said relieved portion terminating between the bosses and the end of the skirt, said piston being provided with circumferential slots between the piston head and skirt, with a longitudinal slot connecting the end of the skirt with one of said circumferential slots, and with other circumferential slots between the end of the webs and the open end of the skirt.

21C 8 In a piston for an internal combustion engine, the combination of a head provided with a disc portion and a flange portion and with ring grooves in the flange portion, a pair of substantially rectangular shaped webs integral with and depending from the flange portion of the head, a pair of oppositely disposed wrist pin bosses mounted one in each of said webs, a cross rib in said head and integral with the disc portion and flanges of the head and with said web and piston pin bosses, a skirt for said piston extending below said webs and integrally connected to the side edges of each of said webs, said piston being provided with circumferential slots between the skirt and head, with a longitudinal slot connecting one of said circumferential slots with the bottom edge of the skirt and with circumferential slots between the lower edges of the webs and the adjacent portion of the skirt.

22C 9 A piston for an internal combustion engine, comprising a head, oppositely disposed walls depending from and connected at their upper ends to the head, bosses carried by the said walls out of direct contact with the head, and a skirt structure including two oppositely disposed bearing portions jointed together by extensions below each of the said bosses and indirectly connected to the head by the said walls, the skirt structure being separated, by air gaps, from the head at its upper edge and from the said walls below the bosses.

Per K

8454

~~23~~ 10 A piston for an internal combustion engine comprising a head, oppositely disposed walls depending from and connected at their upper ends to the head, the walls being depressed within the maximum diameter of the piston, bosses carried by the said walls out of direct contact with the head, and a skirt structure, including two oppositely disposed bearing portions joined together by extensions below each of the said bosses and indirectly connected to the head by the said walls, the skirt structure being separated, by air gaps, from the head at its upper edge, and from the said walls below the bosses.

~~24~~ 11 A piston for an internal combustion engine comprising an integral head and skirt, the said skirt consisting of oppositely disposed cylinder engaging bearing walls separated from the head by circumferential slots, a slot extending lengthwise of one of the said bearing walls, depressed walls connecting the said bearing walls, and other cylinder engaging walls connecting the first said bearing walls and separated from the said depressed walls by circumferential slots. (sig.)

Respectfully submitted,

J. King Harness,
Attorney for Applicant.

Dated: June 22nd, 1926,
c/o Chrysler Corporation
Detroit, Michigan.

434467—77

2—079

INTERFERENCE.

Interference No. 54092 Paper No. 42
Name, Howard E. Maynard
Serial No. 434,467
Title, Pistons
Filed, Jan. 3, 1921
Interference with Frank Jardine and Ferdinand Jehle

DECISIONS OF

Law Examiner,	Dated,
Ex'r of Interferences, Favorable	Dated, Feb. 3/27
Board,	Dated,
Commissioner,	Dated,

REMARKS:

.....

.....

This should be placed in each application or patent involved in interference in addition to the interference letters by Primary Examiner.

434467—78

(Patent Office Jul 16 '26 Mailed)

213

Div. 12 Room 380 Paper No. 43

Address only
"The Commissioner of Patents,
Washington, D. C."
and not any official by name

All communications respecting this application should give the serial number, date of filing, and name of the applicant

Pi-J
6/29/26

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
Washington

Please find below a communication from the Examiner in charge of this application.

THOMAS E. ROBERTSON,
Commissioner of Patents.

J. King Harness
1211 Majestic Bldg.,
Detroit, Michigan.

Applicant: Howard E. Maynard
Ser. No. 434,467
Filed Jan. 3, 1921
For Pistons

The case, above referred to, is forwarded to the Examiner of Interferences because it it is adjudged to inter-

fere with others, hereafter specified. The question o
priority will be determined in conformity with the Rules
The interference will be identified as No. 54092. On o
before Aug 24 1926 the statement demanded by rule
110 must be sealed up and filed, with the subject of in-
vention, and name of party filing it, indorsed on the
envelope. The subject-matter involved in the interfer-
ence is

Counts.

1. In a piston for an internal combustion engine, the combination of a head, a plurality of webs integral with said head and having oppositely disposed wrist pin bosses mounted one in each web, a skirt integral with said webs relieved adjacent said webs to a point between the bosses and the end of the skirt, said piston being provided with circumferential slots between the piston head and skirt and with a longitudinal slot connecting the open end of the skirt with one of the circumferential slots.

2. In a piston for an internal combustion engine, the combination of a head and a plurality of webs integral with said head, diametrically oppositely disposed wrist pin bosses, one mounted in each of said webs and integral therewith, a skirt integral with said webs, relieved adjacent said webs, said relieved portion terminating between the bosses and the end of the skirt, said piston being provided with circumferential slots between the piston head and skirt, with a longitudinal slot connecting the end of the skirt with one of said circumferential slots, and with other circumferential slots between the end of the webs and the open end of the skirt.

3. In a piston for an internal combustion engine, the combination of a head provided with a disc portion and a flange portion and with ring grooves in the flange portion, a pair of substantially rectangular shaped webs integral with and depending from the flange portion of the head, a pair of oppositely disposed wrist pin bosses mounted one in each of said webs, a cross rib in said head and integral with the disc portion and flanges of the head and with said web and piston pin bosses, a skirt for said piston extending below said webs and integrally connected to the side edges of each of said webs, said piston being provided with circumferential slots between the skirt and head, with a longitudinal slot connecting one of said circumferential slots with the bottom edge of

the skirt and with circumferential slots between the lower edges of the webs and the adjacent portion of the skirt.

4. A piston for an internal combustion engine comprising a head, oppositely disposed walls depending from and connected at their upper ends to the head, bosses carried by the said walls out of direct contact with the head, and a skirt structure including two oppositely dis-

434467—79

434,467—2

posed bearing portions joined together by extensions below each of the said bosses and indirectly connected to the head by the said walls, the skirt structure being separated, by air gaps, from the head at its upper edge, and from the said walls below the bosses.

5. A piston for an internal combustion engine comprising a head, oppositely disposed walls depending from and connected at their upper ends to the head, the walls being depressed within the maximum diameter of the piston, bosses carried by the said walls out of direct contact with the head, and a skirt structure including two oppositely disposed bearing portions joined together by extensions below each of the said bosses and indirectly connected to the head by the said walls, the skirt structure being separated, by air gaps, from the head at its upper edge, and from the said walls below the bosses.

6. A piston for an internal combustion engine comprising an integral head and skirt, the said skirt consisting of oppositely disposed cylinder engaging bearing walls separated from the head by circumferential slots, a slot extending lengthwise of one of the said bearing walls, depressed walls connecting the said bearing walls, and other cylinder engaging walls connecting the first said bearing walls and separated from the said depressed walls by circumferential slots.

This interference involves your application above identified and an application for Pistons, filed by Frank Jardine and Ferdinand Jehle of c/o Aluminum Manufactures, Inc., Cleveland, Ohio, whose attorney is Richey and Watts of 1983 Union Trust Bldg., Cleveland, Ohio, and whose assignee is the Aluminum Manufactures, Inc., of Cleveland, Ohio, a corporation of Delaware.

The relation of the counts of the interference to the claims of the respective parties is as follows:

Counts	Jardine et al	Maynard
1	1	19
2	2	20
3	5	21
4	7	22
5	8	23
6	9	24.

P. P. PIERCE,
Examiner.
434467—30

(Mailed Mar 2-1927)

260

Div. 12 Room 380 Paper No. 44

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name

All communications respecting this application should give the serial number, date of filing, and name of the applicant

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

Pi-J Washington March 2, 1927

Please find below a communication from the Examiner in charge of this application.

THOMAS E. ROBERTSON,
Commissioner of Patents.

Application: Howard E. Maynard
Ser. No. 434,467
Filed Jan. 3, 1921
For Pistons

J. King Harness
1211 Majestic Bldg.,
Detroit, Michigan

Interference No. 54,092 in which this application was recently involved having been decided favorable to ap-

plicant, further action by the Office awaits response to the rejection of March 23, 1926.

P. P. Pierce,
Examiner.

remailed
c/o Chrysler Corp.
Detroit, Mich.
3/9/27

434467—81

U. S. Patent Office
Mar 18 1927
Division 12, Paper No. 45

POWER TO INSPECT

The undersigned attorney in the application of Howard E. Maynard for improvements in Pistons, Serial No. 434,467, filed January 3, 1921, hereby gives unto Francis D. Thomas, of the firm of Bacon and Thomas, Washington, D. C., full power to inspect the said application.

J. KING HARNESS.

March 15th, 1927,
c/o Chrysler Corporation,
Detroit, Michigan.

OK
P. P. Pierce
Mch/18/27

434467—82

(Application Div. Mar 22 1927 U. S. Patent Office)

U. S. Patent Office
Mar 23 1927
Division 12, Paper No. 46

IN THE UNITED STATES PATENT OFFICE

Maynard,
Pistons,
Serial No. 434,467,
Filed Jan. 3, 1921.
H

Hon. Commissioner of Patents,
Washington, D. C.

(13 cls. in case)

Sir:— *Cancel claims 8 to 18 inclusive.*

In the matter of the above entitled application, and

and March 2, 1927, respectively, applicant begs to respectfully request that the office more specifically state its ground of rejection of claims 1 to 7. In other words, the mere rejection of these claims on the multiplicity of counts constituting the previously decided interferences is entirely insufficient for applicant to determine just what the Examiner has in mind. As far as counsel can determine, counts 1 to 7 are clearly patentable over the counts of all the previous interferences, and should be allowed forthwith. It is, however, believed, that the Examiner should apply claims 1 to 7 to the particular interferences or interference counts he has in mind in order that applicant might make an intelligent response.

Respectfully submitted,

MAYNARD,

By J. KING HARNESS,

Attorney.

March 21, 1927

434467—83

(Mailed Oct 19 1927)

260

Div. 12 Room 380 Paper No. 47

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name

All communications respecting this application should give the serial number, date of filing, and name of the applicant

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

Chu-J Washington Oct. 19, 1927

Please find below a communication from the Examiner in charge of this application.

THOMAS E. ROBERTSON,

Commissioner of Patents.

Applicant: Howard E. Maynard
Ser. No. 434,467
Filed Jan. 3, 1921
For Pistons

J. King Harness
1211 Majestic Bldg.,
Detroit, Michigan

Amended March 22, 1927.

Additional reference:

Schmiedeknecht, 1,256,265, Feb. 12, 1918 (74-108-8)

In claim 1 there is no antecedent for "segmental portions" in the tenth line of the claim.

Upon reconsideration claim 3 is rejected on Schmiedeknecht, cited, who discloses a piston comprising a head and a skirt with a web connecting oppositely bearing portions and with opening slots between the web and the cylindrical portion of the skirt below the web.

Claims 4, 6 and 7 are rejected as being functional, there being insufficient structure set up to perform the operations and functions indicated by the matter in the claims following "whereby."

Claim 5 is rejected as being unpatentable over Schmiedeknecht in view of Ebbs, of record. This claim is also rejected as being functional as insufficient structure is shown whereby the operations indicated in the latter part of the claim are performed.

The claims which are rejected upon the single ground of functionality, when amended to overcome this condition, will probably be allowed as they define a structure which is in accord with the issues of the interferences in which the applicant received a favorable decision.

Claims 1, 2 and 19 to 24 inclusive are allowed subject

434467—84

(This Action Must be Responded to Within Six Months.)

434,467—2

to the corrections of informal matters noted above.

P. P. Pierce,
Examiner.

434467—85

8453

(Application Div. Oct 29 1927 U. S. Patent Office)

U. S. Patent Office
Oct 31 1927
Division 12, Paper No. 48

IN THE UNITED STATES PATENT OFFICE

Div. 12
Howard E. Maynard
Filed Jan. 3, 1921
Pistons
Serial No. 434,467

POWER TO INSPECT

Hon. Commissioner of Patents,

Sir:

In the matter of the above entitled application, kindly permit the firm of Bacon & Thomas, 724 Ninth Street, N. W., Washington, D. C., to inspect the file of this case and make copies.

J. KING HARNESS,
Attorneys.

Oct. 28, 1927
OK
PPP
Oct 31/27

434467—86

8455

(Mail Room Nov. 10 1927 U. S. Patent Office)

U. S. Patent Office
Nov 11 1927
Division 12, Paper No. 49

IN THE UNITED STATES PATENT OFFICE

Div. 12, Room 380
Howard E. Maynard
Pistons
Serial No. 434,467
Filed Jan. 3, 1921
} Amendment

Commissioner of Patents,
Washington, D. C.

Sir:

I In response to Office Action of October 19th, 1927.
Cancel claims 3 and 5

Claim 1, line 4, before "webs" insert *said skirt having a pair of spaced segmental portions.* Same claim, line 8, before "skirt" insert *segmental portions of the.* Same line, cancel "extending between said webs." Same claim, next to the last line, change "portion" to *portions.*

Claims 4, 6 and 7, lines 6, 9 and 4 respectively, change "whereby" to *separating.*

Claims 4, 6 and 7, lines 7, 10 and 4 respectively, change "are" to *being.*

REMARKS

The rejected claims have been cancelled and the formal objections to claims 1, 4, 6 and 7 have been remedied so that the case is now in condition for allowance.

Respectfully submitted,

J. KING HARNESS,

Attorney for Applicant.

Dated November 7th, 1927,
c/o Chrysler Corporation,
Detroit, Michigan.

434467—87

(Mailed Nov 25 1927)

181

Div. 12—BDJ Serial No. 434,467

Address only
The Commissioner of Patents
Washington, D. C.

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

Washington

November twenty-five, 1927

Howard E. Maynard, Assors. etc.

Your Application for a patent for an Improvement in Pistons filed Jan. 3, 1921 has been examined and Allowed with 11 claims.

The final fee, Twenty Dollars, With $1 Additional for Each Claim Allowed in Excess of 20, must be paid not later than Six Months from the date of this present notice of allowance. If the final fee be not paid within that period, the patent will be withheld, but the applica-

tion may be renewed within one year after the date of the original notice with a renewal fee of $20 and $1 additional for each claim in excess of 20.

The office delivers patents upon the day of their date, on which date their term begins to run. The preparation of the patent for final signing and sealing will require about four weeks, and such work will not be begun until after payment of the necessary final fee.

When the final fee is paid, there should also be sent, Distinctly and Plainly Written, the name of the Inventor, Title of the Invention, and Serial Number as Above Given, Date of Allowance (which is the date of this circular), Date of Filing, and, if assigned, the Names of the Assignees.

If it is desired to have the patent issue to an Assignee or Assignees, an assignment containing a Request to that effect, together with the Fee for recording the same, must be filed in this office on or before the date of payment of the final fee.

After issue of the patent, uncertified copies of the drawings and specifications may be purchased at the price of Ten Cents Each. The money should accompany the order. Postage stamps will not be received.

The final fee will Not be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Notice.—When the Number of Claims Allowed is in Excess of 20, no Sum Less than $20 Plus $1 Additional for Each Claim in Excess of Twenty Can Be Accepted as the Final Fee.

Respectfully,

THOMAS E. ROBERTSON,
Commissioner of Patents.

J. King Harness
1211 Majestic Bldg.,
Detroit, Michigan

☞In Remitting the Final Fee Give the Serial Number at the Head of this Notice.

☞Uncertified Checks Will Not Be Accepted.

434467—88

B

($20 Rec'd Dec 15 1927 C. C. U. S. Pat. Office Ck J)

CHRYSLER CORPORATION
Detroit, Michigan, U. S. A.
December 13th, 1927

Commissioner of Patents,
Washington, D. C.

Sir:

I hand you herewith check for twenty dollars ($20.00) in payment of the final fee in the application of Howard E. Maynard for Pistons, Serial No. 434,467, Filed January 3, 1921, allowed November 25, 1927, and assigned to Chrysler Corporation.

It is hoped that the patent may now be issued at an early date.

Very truly yours,

J. KING HARNESS,
Patent Counsel.

JKH:EB

434467—89

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Div. 12 Room 380 **Paper No. 50**

Address only
"The Commissioner of Patents,
Washington, D. C.,"
and not any official by name

All communications respecting this application should give the serial number, date of filing, and name of the applicant

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
Washington Dec. 29, 1927.

Please find below a communication from the Examiner in charge of this application.

THOMAS E. ROBERTSON,
Commissioner of Patents.

J. King Harness,
1211 Majestic Building,
Detroit, Michigan.

Applicant H. E. Maynard,
Ser. No. 434,467,
Filed Jan. 3, 1921,
For Pistons.

In accordance with the provisions of Order No. 2308, dated March 12, 1917, which reads in part as follows:

* * * * * *

> Obvious informalities in the application may be corrected by the examiner, but said correction must be in the form of an amendment, approved by the Principal Examiner in writing, placed in the file, and made a part of the record. The changes specified in the amendment will be entered by the clerk in the regular way.

* * * * * *

the changes, hereinafter specified, are made by the examiner in the application above identified.

Should these changes not be satisfactory to the applicant, appropriate amendment may be proposed under the provisions of Rule 78, provided the specification has not been printed.

The application has been amended as follows:

K

In claim 9, line 5, "jointed" has been changed to *joined*.

In claim 6, line 2, "*disposed*" has been inserted after "oppositely."

FRANCIS G. COLE,
Acting Examiner.

INC

434467—90

(Mail Room Sep 30 1930 U. S. Patent Office)

#51

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF OHIO (Eastern Division)

HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (~~41~~ 42 Stat. L.....), you are advised that there was filed on the 29th day of September, 1930, in this court an action, suit, or proceeding No. 3510 entitled

Name The Cleveland Trust Company
Cleveland, Ohio Plaintiff
Address Chrysler Corporation
Highland Park, Michigan

versus

Name The Simmons Manufacturing Company
3405 Perkins Ave., Cleveland, Ohio Defendant
Address Sterling Products Corporation
2914 North Market St., St. Louis, Missouri

brought upon the following patents:

Patent No.	Date of Patent.	Patentee.
1,092,870	April 14, 1914	Edward O. Spillman and Louis P. Mooers
1,402,309	Jan. 3, 1922	L. P. Mooers
1,153,902	Sept. 21, 1915	Gustave E. Franquist
~~1,473,233~~	~~Nov. 6, 1923~~	H. & H. Machine Company
16,273 Reissue	Feb. 23, 1926	Cleveland Trust Company
1,655,968	Jan. 10, 1928	Chrysler Corporation and Aluminum Co.
1,763,523	June 10, 1930	Cleveland Trust Company
1,256,265	Feb. 12, 1918	Victor E. Schmiedeknecht

Patent No.	Date of Patent.	Patentee.

In the above-entitled case the following decision has been rendered or decree issued:

In Witness Whereof I have affixed my hand this 29th day of Sept., 1930, at Cleveland, Ohio.

~~B. C. Mraam,~~
F. J. Denzler,
Clerk of said Court.

By Ruth Strain,
Deputy Clerk.

434467—91

Notice on filing of patent case

DISTRICT COURT OF THE UNITED STATES

NORTHERN DISTRICT OF OHIO

EASTERN DIVISION

Honorable Commissioner of Patents, Washington, D. C.

SIR:

In compliance with the Act of February 18, 1922 (41 Stat. L. .....), you are advised that there was filed on the 29th day of September, 1930, ~~1931,~~ in this court an action, suit, or proceeding, No. 3510, entitled—

Name The Cleveland Trust Company, Plaintiff
Cleveland, Ohio

Name Chrysler Corporation,
Michigan

versus

Name The Simons Manufacturing Company, Defendant
Cleveland, Ohio

Name Sterling Products Corporation,
St. Louis, Missouri

brought upon the following patents:

PATENT No.	DATE OF PATENT.	PATENTEE.
1,092,870	April 14, 1914	Edward O. Spillman & Louis P. Mooers
1,402,309	Jan. 3, 1922	L. P. Mooers
1,153,902	Sept. 21, 1915	Gustave E. Franquist
1,473,233	Nov. 6, 1923	H. & H. Machine Company
16,273 Reissue	Feb. 23, 1926	Cleveland Trust Company
1,655,968	Jan. 10, 1928	Chrysler Corp. and Aluminum Co.
1,763,523	June 10, 1930	Cleveland Trust Company
1,256,265	Feb. 12, 1918	Victor E. Schmiedeknecht

In the above-entitled case, on the ..... day of ....., 193.., the following patents have been included by .....
(Insert amendment, answer, cross bill, or other pleading)

PATENT No.	DATE OF PATENT.	PATENTEE.

In the above-entitled case the following decision has been rendered or decree issued: Sept. 25, 1931 Interlocutory Decree filed & ent.; Letters Patent Nos. 1,092,870,

1,153,902, 1,256,265, 1,402,309, Re-16,273, good and valid in law; The Cleveland Trust Co. owner; Letters Patent No. 1,655,968, good and valid in law; The Cleveland Trust Co. and Chrysler Corp. owner; Letters Patent Nos. 1,763,523, 1,815,733 are good and valid in law and pltf, The Cleveland Trust Co. owner; that defendant the Simmons Manufacturing Co. has infringed all of said Letters Patent; Plaintiff to recover of defendant; that cause be referred to Wm. B. Woods, Special Master for accounting; injunction granted; Pltf. to recover of defendant costs Jones Judge.

IN WITNESS WHEREOF, I have affixed my hand this 28th day of September, 1931, at Cleveland, Ohio.

~~B. C. MILLER,~~
F. J. Denzler,
Clerk.

By W. L. STEVENS,
Deputy Clerk.

434467—32

PRINTER'S NOTE:

A copy of U. S. Patent No. 1,655,968, Jan. 10, 1928, to H. E. Maynard was bound into the original of this Exhibit at this point but inasmuch as it appears, *supra*, at page 1299 as Plaintiffs' Exhibit No. 4, it has been omitted to comply with the Equity Rule against duplication.

1/24/27.
2/26/27.

2—421

1921

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1. Application 2 papers.
2. Rej Apr 9 1921
3. Amendment A Sept. 12 1921
4. Rej Jan 9 1922
5. Amendment B Feb. 2, 1922
6. Rej May 11 1922
7. Amendment C May 29, 1922
8. Rej Jul 13 1922
9. Amendment D Aug 16, 1922

10. Rej Oct 5 1922
11. Amendment E March 19, 1923
12. Sug Claim Apr 5 1923
13. Amendment F April 23, 1923
14. Intf Brief "A" (1)
15. Intf Letter "A" (1) Jul 7 1923
16. Intf Brief "B" (2)
17. Intf Letter "B" (2) Jul 7 1923
18. Intf Brief "C" (3)
19. Intf Letter "C" (3) Jul 7 1923
20. Intf Brief "D" (4)
21. Intf Letter "D" (4) Jul 7 1923
22. Intf Brief "E" (5)
23. Intf Letter "E" (5) Jul 7 1923
24. Intf Brief "F" (6)
25. Intf Letter "F" (6) Jul 7 1923
26. Intf Brief "G" (7)
27. Intf Letter "G" (7) Jul 7 1923
28. Intf Brief "H" (8)
29. Intf Letter "H" (8) Jul 7 1923
30. Intf Brief "I" (9)
31. Intf Letter "I" (9) Jul 7 1923
32. Intf Brief "N" (14)
33. Intf Letter "N" (14) Jul 7 1923
34. Intf Brief "U"
35. Intf. Letter "U" Jul 7 1923
36. Amo. Power of Atty Sept. 4/23
37. Add. party (3) Dec 3 1923
38. Party Added (4) Dec 3 1923
39. Fin. Rej. (R. 132) Mar 23 1926
40. Sug. Claims Jun 11 1926
41. Amendment G June 24, 1926
42. Intf Brief
43. Intf Letter Jul 16 1926
44. Letter Mar 2 1927
45. Access Mar 18 1927
46. Amendment H March 22, 1927
47. Rej Oct 19 1927
48. Access Oct 29, 1927
49. Amendment I Nov. 10, 1927
50. Exr's. Amendment K Dec 29, 1927
51. Notice of Suit Sept 30 1930
52. Notice of Suit Sept 29 1931

File Wrapper

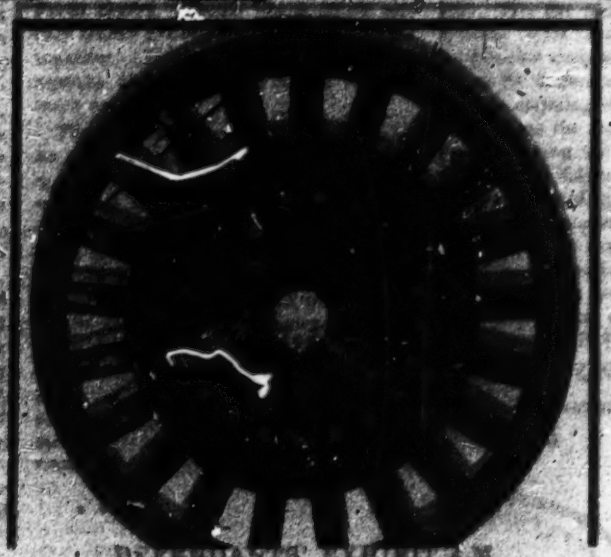
Mathieson Spring Wheels.

The latest announcement in the line of spring wheels comes from the Mathieson Spring Wheel Co., 200 Grand avenue, Chicago, Ill. The wheels are made with an unusually large number of spokes, each containing a spring and plunger.

The spring plungers all press against a central disc which is clamped between the hub flanges, so that the weight is entirely supported by the springs which offer a yielding support in any direction in the plane of the wheel.

Distortion of the wheel out of its proper plane is prevented by large plates which are bolted on diagonal short axle, making a sliding joint between the outer portion, which is supported directly by the tire, and the inner portion, which is rigidly connected. The wheel mechanism is packed in grease so that it is well lubricated and noiseless.

Another model, apparently good for driving wheels, has the spring plungers making contact with, but not connected to, pressure members which are situated in the central disc, the latter member then



DEFENDANT'S EXHIBIT 4-M.
Page 588 of "The Horseless Age" for April 8, 1914.
(Filed January 27, 1934.)

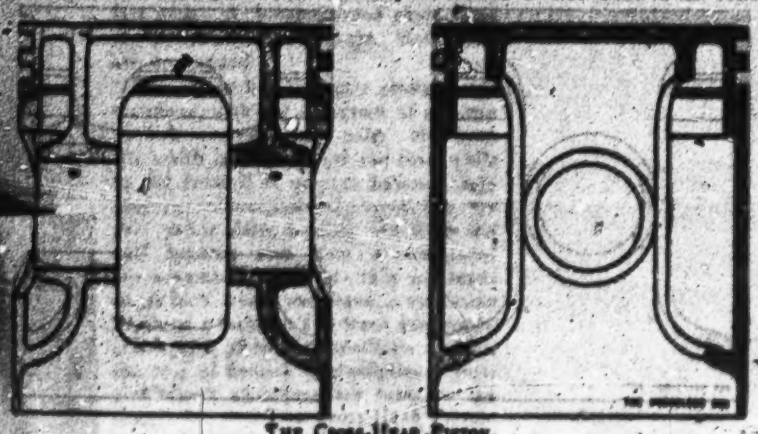
in the style shown. Solid tires are used with these wheels, and riding qualities equal or superior to pneumatic tires are claimed.

Herschell-Spillman Cross-Head Piston.

The present cross-head type of piston is a new device in which considerable interest has developed within the last few months. Arrangements have now been made whereby the Herschell-Spillman Co., North Tonawanda, N. Y., will manufacture this design of piston for the use of other engine builders.

As the name indicates, the piston head, containing also the packing rings, is separated from the skirt or crosshead portion of the piston, yet they are connected in one unit. Gooseneck rods containing the piston pin bosses connect the two portions.

The main advantage of the new type of piston is that the great heat of the piston head is not allowed to follow



THE CROSS-HEAD PISTON.

down the piston wall and cause expansion and distortion. The hole air gap prevents this, and the ring set is practically free, distorting part of the heat and transferring the rest to the lower portion of the crosshead, where it is absorbed and transferred to the water jacket without distortion.

It has been found that the cross-head in a 4-inch cylinder will run without slap if it is .0005 smaller than the cylinder bore, and that it will not cause trouble if it is only .001 under size, thus giving much greater working faces than in the conventional construction. Of course, the ring faces can be given only as great a clearance as desired without affecting the quietness of the engine.

It is said that the character of the crank case oil shows less lacquer than with ordinary pistons; also that carbonization on the piston head is much less. Increased weight seems to be the only objection which can be urged, and that is stated to be inconsiderable. A Herschell-Spillman 4-inch piston of ordinary type, with 3½-inch piston pin hole weighs 21 ounces, while the cross-head type weighs 24 ounces.

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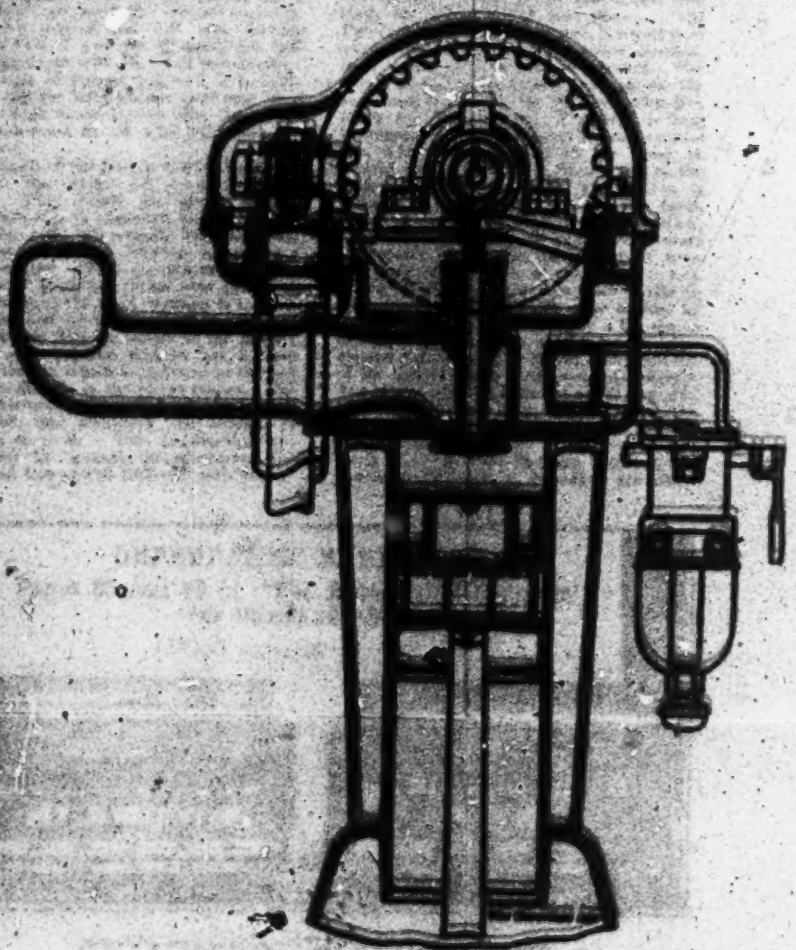
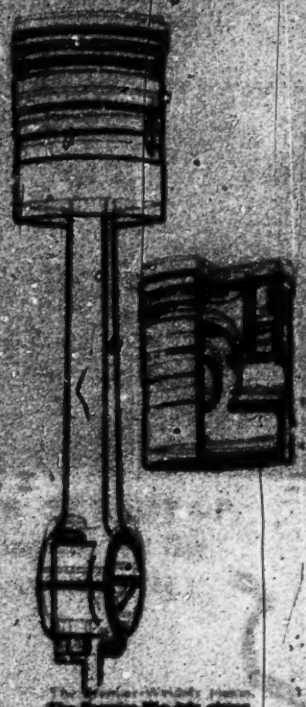
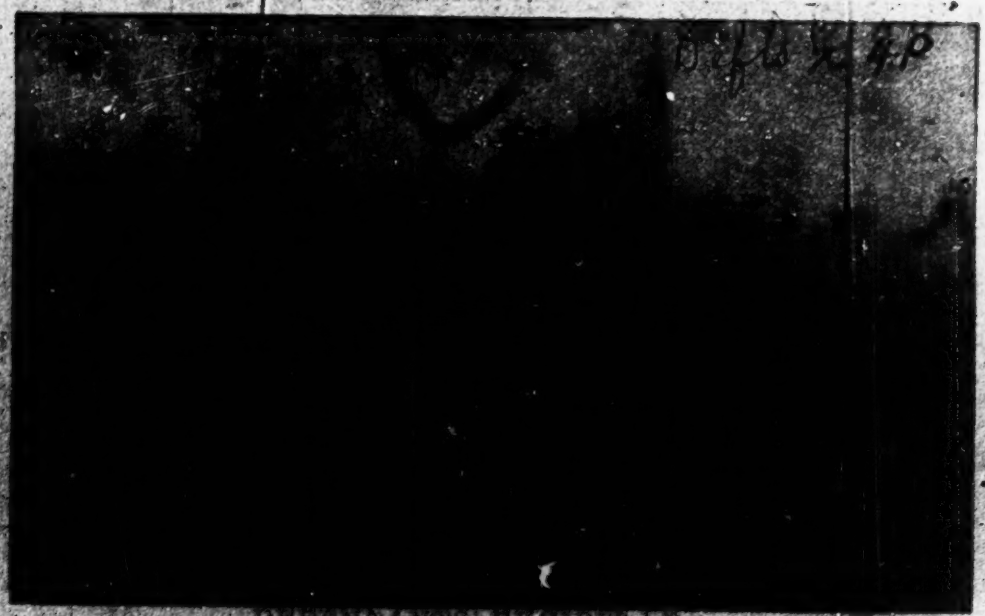
DEFENDANTS' EXHIBIT 4-H.
Page 1051 of "The Horseless Age" for December 24, 1913.
(Filed January 27, 1934.)



Cross Section of Pneumatic Motor Spoke Construction

DEFENDANTS' EXHIBIT 4-G.
Pages 68 and 69 of "The Automobile Engineer"
for March 15 1914.
(Filed January 27, 1934)





DEFENDANTS' EXHIBIT 4-P.
Postal Showing Staver Car.
(Filed January 27, 1934.)

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DEFENDANTS' EXHIBIT 4-Q.
D'Vorsky Sketch of Monitor Piston.
(Filed January 27, 1934.)

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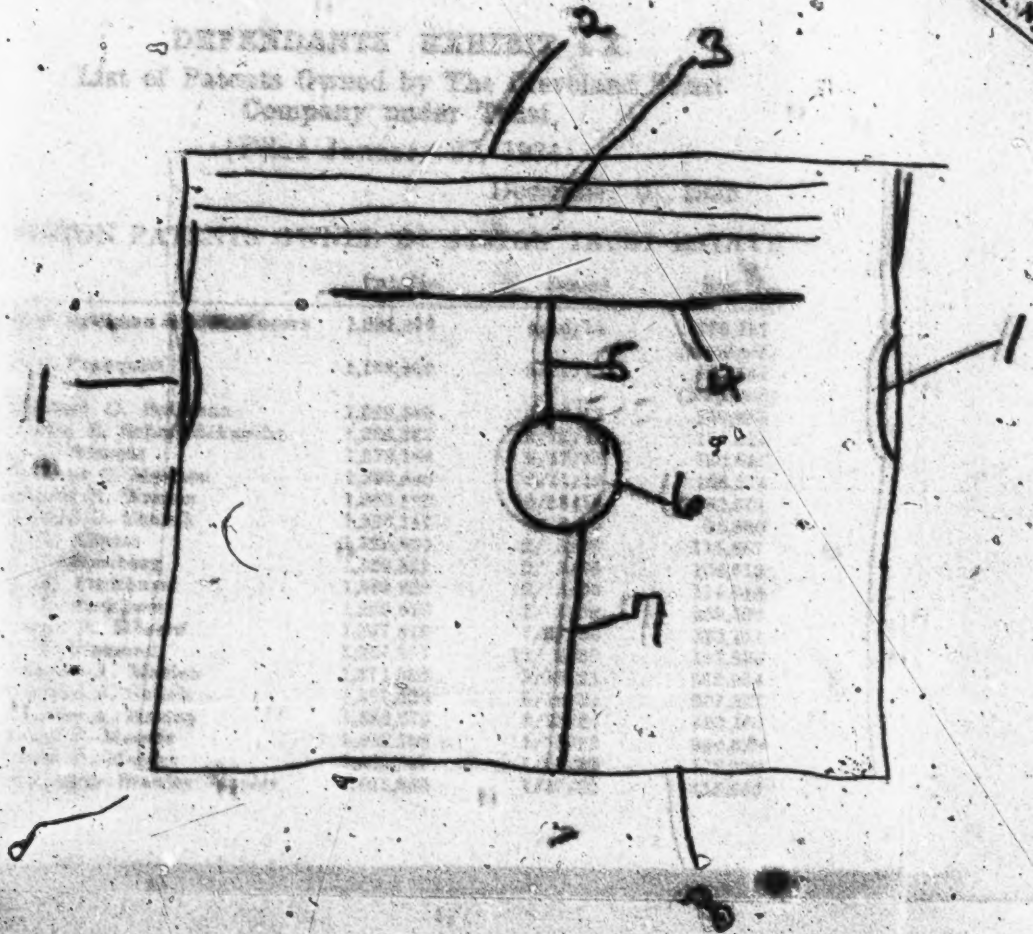
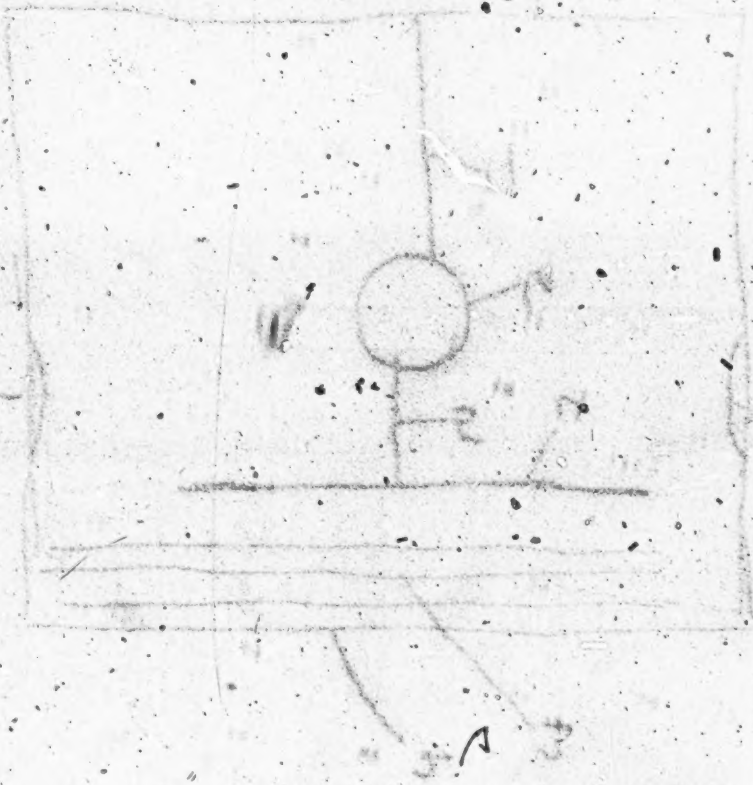
F. J. DENZLER, Clerk
U. S. District Court, N. D. O.





DEFENDANTS' EXHIBIT 4-R.

Digest of Defendants' Exhibit 4-R.

(The Anamosa Journal, Anamosa, Iowa, Thursday, June 10, 1915.)

Third Race, 30 Mile Auto Race $500

(Monckmeier, Staver Six, First)

DEFENDANTS' EXHIBIT 4-X.

List of Patents Owned by The Cleveland Trust Company under Trust.

(Filed January 27, 1934)

December 10, 1932

PISTON PATENTS OWNED BY PISTON TRUST ESTATE

	Pat. No.	Issued	Ser. No.
E. O. Spillman & L. P. Moores	1,092,870	4/14/14	779,757 (Expired)
G. E. Fraquist	1,153,902	9/21/15	854,484 (Expired)
Edward O. Spillman	1,229,540	6/12/17	130,823
Victor E. Schmiedeknecht	1,256,265	2/12/18	180,511
J. G. Vincent	1,279,184	9/17/18	796,647
Howard C. Marmon	1,293,846	2/11/19	108,274
Robert B. Wasson	1,320,189	10/28/19	83,601
Harold D. Church	1,327,147	1/ 6/20	96,880
E. E. Allyne	1,329,820	2/ 3/20	115,887
J. H. Bamberg	1,329,821	2/ 3/20	106,513
F. A. Parkhurst	1,329,822	2/ 3/20	110,844
F. A. Parkhurst	1,329,823	2/ 3/20	259,596
Louis P. Moores	1,347,819	7/27/20	333,111
J. E. Diamond	1,357,851	11/ 2/20	117,894
Charles A. Marien	1,371,320	3/15/21	302,904
Edward J. Gulick	1,387,538	8/16/21	307,527
Charles A. Marien	1,393,279	8/23/21	420,360
Louis P. Moores	1,402,308	1/ 3/22	390,623
Louis P. Moores	1,402,309	1/ 3/22	172,380
Montague Stanley Napier	1,403,580	1/17/22	418,959

	Pat. No.	Issued	Ser. No.
William Guy Berry et al	1,408,066	2/28/22	478,195
Edmund E. Allyne	1,426,138	8/15/22	270,318
F. A. Parkhurst	1,440,549	1/ 2/23	409,304
Roland M. Howdeshell	Re-12,273	2/23/26	51,529
(Original Pat.	1,473,233		383,519)
Harry J. Hater	1,485,078	2/26/24	558,234
James M. Howe	1,494,483	5/20/24	466,415
Laurence Henry Pomeroy	1,529,073	6/24/24	321,696
Montague Napier	1,525,316	2/ 3/25	419,715
William G. Berry et al	1,551,233	8/25/25	410,264
Harry J. Hater	1,563,925	11/24/25	676,744
Frank Jardine	1,563,194	11/24/25	47,213
Jardine & Jehle	1,580,491	4/13/26	466,371
Allen B. Norton	1,633,184	6/21/27	80,902
George D. Welty	1,638,898	8/16/27	39,676
Howard E. Maynard (½ Int.)	1,655,968	1/10/28	434,467
Harry J. Hater	1,656,432	1/17/28	588,473
Gustav R. Kelm	1,659,881	2/21/28	470,502
Stephen D. Hartog	1,675,174	6/26/28	53,063
James Edward Diamond	1,695,417	12/18/28	561,997
Harold J. Ness	1,699,621	1/22/29	100,496
Harold J. Ness	1,699,621	1/22/29	100,497
Frank Jardine	1,727,647	9/10/29	100,773
Frank Jardine	1,730,120	10/ 1/29	100,772
Stephen D. Hartog	1,730,885	10/ 8/29	201,169
Stephen D. Hartog	1,732,361	10/22/29	227,705
Jeffries & Archer	1,732,557	10/22/29	707,868
Frank Jardine	1,741,843	12/31/29	47,234
Wm. C. McCoy	1,757,131	5/ 6/30	234,398
Jehle & Jardine	1,758,444	5/13/30	544,487
Frank Jardine	1,759,508	5/20/30	137,194
Wm. C. McCoy	1,761,140	6/ 3/30	133,909
Wm. C. McCoy	1,761,141	6/ 3/30	143,878
Wm. C. McCoy	1,761,142	6/ 3/30	331,513
Frank Jardine	1,763,523	6/10/30	364,997
(Renewal of Ser. No.	450,896)		
Harry J. Hater	1,764,871	6/17/30	291,427
Frank J. Kent	1,768,608	7/ 1/30	201,600
Harry J. Hater	1,769,835	7/ 1/30	188,736
George D. Welty	1,775,446	9/ 9/30	125,764
Frank Jardine	1,784,291	12/ 9/30	100,771
Stephen D. Hartog	1,794,767	3/ 3/31	467,587
Wm. C. McCoy	1,802,180	4/21/31	400,476
Melbourne A. Beckmann	1,768,815	7/ 1/30	369,130
Melbourne A. Beckmann	1,768,816	7/ 1/30	369,131
Stephen D. Hartog	1,812,696	6/30/31	226,832
Edward J. Gulick	1,815,733	7/21/31	294,861
Martin B. Covert	1,818,207	8/11/31	442,969
Frank Jardine	1,819,996	8/18/31	340,088
Harry J. Hater	Re-18,178	9/ 8/31	379,321
(Original Pat. No.	1,856,488)		
William C. McCoy	1,825,750	10/ 6/31	143,879
G. E. Franquist	1,826,171	10/ 6/31	583,782
Louis P. Moores	1,826,185	10/ 6/31	649,481
William C. McCoy	1,830,519	11/ 3/31	451,855
Frank Jardine et al	1,835,874	12/ 8/31	79,651
Frank Jardine et al	1,835,875	12/ 8/31	174,202
Stephen D. Hartog	1,842,022	1/19/32	359,137
Stephen D. Hartog	1,842,023	1/19/32	611,969
Frank Jardine	1,847,947	3/ 1/32	312,429
Allen B. Norton	1,853,450	4/12/32	51,748
Gustave E. Franquist	1,872,724	8/23/32	531,962
James E. Diamond	1,874,925	8/30/32	126,110

DEFENDANTS' EXHIBIT 4-Y.

Bill of Complaint and Answer in Case No. 27-32 in the U. S. District Court for the Southern District of New York, The Cleveland Trust Company vs. The National Piston Company, Inc.

(Filed January 27, 1934.)

UNITED STATES OF AMERICA,
SOUTHERN DISTRICT OF NEW YORK, ss.

I, CHARLES WEISER, Clerk of the District Court of the United States for the Southern District of New York do hereby certify that the writings annexed to this certificate have been compared with their originals on file and remaining of record in this office; that they are correct transcripts therefrom and of the whole of the said originals.

IN TESTIMONY WHEREOF I have hereunto subscribed my name and affixed the seal of the said Court at the City of New York, in the Southern District of New York, this 27th day of January in the year of our Lord one thousand nine hundred and thirty-three and of the Independence of the United States the One Hundred and fifty-seventh.

CHARLES WEISER,
Clerk.

(Seal)

IN THE UNITED STATES DISTRICT COURT
IN AND FOR THE SOUTHERN DISTRICT OF NEW YORK

THE CLEVELAND TRUST COMPANY,
Plaintiff,
vs.
THE NATIONAL PISTON COMPANY, INCORPORATED,
Defendant.
} IN EQUITY No. 27-32

BILL OF COMPLAINT.

To the Honorable Judges of the United States District Court for the Southern District of New York:

The Cleveland Trust Company, a corporation organized and existing under and by virtue of the laws of the State of Ohio, and having its principal office and place

of business at Cleveland in said State, brings this bill of complaint against The National Piston Company, Incorporated, a corporation organized and existing under and by virtue of the laws of the State of New York, having a regular established place of business at New York City in the State of New York, within the aforesaid Southern District of New York, and thereupon your Orator complains and says:

I.

That your Orator, The Cleveland Trust Company, is a corporation duly organized and existing under and by virtue of the laws of the State of Ohio, and has its principal office and place of business in Cleveland in said State.

II.

That the defendant, The National Piston Company, Incorporated, is a corporation duly organized and existing under and by virtue of the laws of the State of New York, and has a regular established place of business and principal office at New York City in the State of New York, within the aforesaid Southern Judicial District of New York, where it has committed and is threatening to continue to commit the acts of infringement hereinafter set forth.

III.

That the jurisdiction of the court in this cause is based upon the fact that the suit is one touching patent rights, and is brought to restrain infringement of certain Letters Patent owned by the plaintiff, and for an accounting of profits and damages arising from past infringement of said Letters Patent by the defendant.

IV.

That heretofore and before the 18th day of July, 1913, Edward O. Spillman and Louis P. Mooers, citizens of the United States, residing in the County of Niagara, State of New York, were the original, first and joint inventors of certain new and useful improvements in Pistons for Explosion Engines or Motors, fully described in Letters Patent of the United States No. 1,092,870, hereinafter mentioned, which invention or improvement was not known or used by others in this country, or pat-

ented or described in any printed publication in this or any foreign country, prior to their invention thereof, or more than two years prior to their application for said Letters Patent, and had not been in public use or on sale in this country for more than two years prior to said application, and had not been abandoned to the public, and had not been patented or caused to be patented by them or their legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of their application for Letters Patent of the United States therefor; that the said Edward O. Spillman and Louis P. Mooers made due application to the Commissioner of Patents of the United States in accordance with the then existing acts of Congress, for Letters Patent of the United States for said invention or improvement, and having in all respects complied with the conditions and requisitions of said acts of Congress, on the 14th day of April, 1914, Letters Patent of the United States No. 1,092,870, signed, sealed and executed in due form of law for the said invention or improvement were issued and delivered unto said Edward O. Spillman and Louis P. Mooers, whereby there was secured unto them, their successors and assigns for the term of seventeen years from the said 14th day of April, 1914, the sole and exclusive right to make, use and sell to others to be used, throughout the United States and the territories thereof the aforesaid invention or improvement, all as by said Letters Patent, or a duly authenticated copy thereof in Court to be produced and shown unto your Honors, will more fully and at large appear.

V.

That subsequent to the granting of the aforesaid Letters Patent The Herschel-Spillman Company, a corporation of the State of New York, acquired an interest in said invention and Letters Patent from the said Edward O. Spillman, and that thereafter and on or about the 16th day of June, 1916, the said Edward O. Spillman and the said The Herschel-Spillman Company, by an instrument in writing duly executed and delivered and duly recorded in the Patent Office of the United States, in Liber R-101, page 1 of the Transfers of Patents, assigned, and transferred an undivided one-half of the entire right, title and interest in and to said Letters Patent No. 1,092,870 to one George B. Pitts; and that there-

after and on or about the 3rd day of July, 1919, the said George B. Pitts by an instrument in writing assigned said undivided one-half of the entire right, title and interest in, to and under said Letters Patent No. 1,092,870, to your Orator, The Cleveland Trust Company, which assignment was duly recorded on the 28th day of July, 1919, in Liber Q-107, page 336 of the Transfers of Patents; and that the said Louis P. Mooers on the 10th day of July, 1919, by an instrument in writing assigned an undivided one-half of the entire right, title and interest in, to and under said Letters Patent No. 1,092,870 to your Orator, The Cleveland Trust Company, which assignment was duly recorded on the 28th day of July, 1919, in Liber Q-107, page 339 of the Transfers of Patents; whereby your Orator became vested with and holds the entire right, title and interest in, to and under said Letters Patent No. 1,092,870, as will more fully and at large appear upon production in Court of the assignments aforesaid.

VI.

That heretofore and before the 22nd day of October, 1913 Jesse G. Vincent, a citizen of the United States, and resident of Detroit, Wayne County, State of Michigan, was the original, first and true inventor of certain new and useful improvements in Pistons, fully described in Letters Patent of the United States No. 1,279,184, hereinafter mentioned, which invention or improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his application for said Letters Patent; had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States therefor; that the said Jesse G. Vincent made due application to the Commissioner of Patents of the United States in accordance with the then existing acts of Congress, for Letters Patent of the United States for said invention and improvement, and by an instrument in writing duly executed and delivered by him, and duly recorded in the Patent Office of

the United States, assigned and transferred the entire right, title and interest in and to said invention and improvement and in and to said application for Letters Patent to Packard Motor Car Company, a corporation organized and existing under the laws of the State of Michigan, and authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for the said invention and improvement to the said Packard Motor Car Company, and having in all respects complied with the conditions and requisitions of said acts of Congress, on the 7th day of September, 1918, Letters Patent of the United States No. 1,279,184, signed, sealed and executed in due form of law for the said invention and improvement were issued and delivered unto said Packard Motor Car Company, as assignee of the said Jesse G. Vincent, whereby there was secured unto said Packard Motor Car Company and its successors and assigns for the term of seventeen years from the said 17th day of September, 1918, the sole and exclusive right to make, use and vend to others to be used, throughout the United States and the territories thereof the aforesaid invention and improvement; all as by said Letters Patent, or a duly authenticated copy thereof in Court to be produced and shown unto your Honors, will more fully and at large appear.

VII.

That subsequent to the granting of the aforesaid Letters Patent, namely on or about the 11th day of September, 1922, by an instrument in writing said Packard Motor Car Company assigned the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,279,184 to your Orator, The Cleveland Trust Company, which assignment was duly recorded on the 18th day of September, 1922, in Liber W-117, page 44 of the Transfers of Patents; whereby your Orator became vested with and holds the entire right, title and interest in, to and under said Letters Patent No. 1,279,184 as will more fully and at large appear upon production in Court of the assignment aforesaid.

VIII.

That heretofore and before the 11th day of May, 1916, Harold D. Church, a citizen of the United States and a resident of Detroit, Wayne County, State of Michi-

gan, was the original, first and true inventor of certain new and useful improvements in Hydro-Carbon Motor, fully described in Letters Patent of the United States No. 1,327,147, hereinafter mentioned, which invention or improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his application for said Letters Patent, and had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public; and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent in the United States therefor; that the said Harold D. Church made due application to the Commissioner of Patents of the United States in accordance with the then existing acts of Congress for Letters Patent of the United States for said invention and improvement, and by an instrument in writing duly executed and delivered by him, and duly recorded in the Patent Office of the United States, assigned and transferred the entire right, title and interest in and to said invention and improvement and in and to said application for Letters Patent to Packard Motor Car Company, a corporation organized and existing under the laws of the State of Michigan, and authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for said invention and improvement to the said Packard Motor Car Company, and having in all respects complied with the conditions and requisitions of said acts of Congress, on the 6th day of January, 1920, Letters Patent of the United States No. 1,327,147, signed, sealed and executed in due form of law for the said invention and improvement were issued and delivered unto said Packard Motor Car Company, as assignee of said Harold D. Church, whereby there was secured unto said Packard Motor Car Company and its successors and assigns for the term of seventeen years from the 6th day of January, 1920, the sole and exclusive right to make, use and vend to others to use throughout the United States and the territories thereof, the aforesaid invention and improvement; all as by said Letters Patent, or a duly authenticated copy thereof in Court to be produced and shown unto your Honors, will more fully and at large appear.

IX.

That subsequent to the granting of the aforesaid Letters Patent, namely on or about the 11th day of September, 1922, by an instrument in writing, said Packard Motor Car Company assigned the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,327,147 to your Orator, The Cleveland Trust Company, which assignment was duly recorded on the 18th day of September, 1922, in Liber C-117 page 64 of the Transfers of Patents; whereby your Orator became vested with and holds the entire right, title and interest in, to and under said Letters Patent No. 1,327,147, as will more fully and at large appear upon production in Court of the assignment aforesaid.

X.

That heretofore and before the 2nd day of June, 1917, Louis P. Mooers, a citizen of the United States, residing at Cincinnati, Hamilton County, State of Ohio, was the original, first and true inventor of certain new and useful improvements in Pistons for Internal Combustion Motors, fully described in Letters Patent of the United States No. 1,402,309, hereinafter mentioned, which invention or improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his application for said Letters Patent, had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States, therefor; that the said Louis P. Mooers made due application to the Commissioner of Patents of the United States in accordance with the then existing acts of Congress, for Letters Patent of the United States for said invention and improvement and by an instrument in writing duly executed and delivered by him and duly recorded in the Patent Office of the United States in Liber P-103 page 133 of the Transfers of Patents, assigned an undivided one half of the entire right, title and interest in and to said invention and improvement and in and to said application for Letters Patent to George B. Pitts of Cleveland, Ohio, and

authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for said invention and improvement to said George B. Pitts and Louis P. Mooers; and thereafter, by instruments in writing duly executed and delivered and duly recorded in the Patent Office of the United States, the said George B. Pitts and Louis P. Mooers assigned and transferred unto your Orator, The Cleveland Trust Company, the entire right, title and interest in and to said invention and application for Letters Patent, and authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for said invention to said The Cleveland Trust Company, pursuant to which said assignment the aforesaid Letters Patent No. 1,402,309, signed, sealed and executed in due form of law, for the said invention and improvement, were issued and delivered unto your Orator, The Cleveland Trust Company, on the 3rd day of January, 1922, whereby there was secured unto your Orator and its successors and assigns, for the term of seventeen years from the said 3rd day of January, 1922, the sole and exclusive right to make, use and sell to others to be used, throughout the United States and the territories thereof, the aforesaid invention and improvement, all as by said Letters Patent or a duly authenticated copy thereof, in court to be produced and shown unto your Honors, will more fully and at large appear.

XI.

And your Orator further avers and shows unto your Honors that the said defendant, The National Piston Company, Incorporated, as your Orator is informed and believes, having due and timely notice of said Letters Patent of the United States, and each of them, and well knowing the premises and the exclusive rights and privileges as aforesaid secured to your Orator by the said Letters Patent, but contriving and planning to injure your Orator and deprive it of the profits, benefits and advantages which would have otherwise accrued to your Orator from the said Letters Patent, has been since the grant of each of the Letters Patent aforesaid, and still is in the said Southern District of New York, unlawfully, wrongfully, and without license or permission of your Orator, manufacturing or causing to be manufactured, using and selling Pistons constructed according to and containing the aforesaid inventions, discoveries or improvements patented by said Letters Patent in vio-

lation and infringement of the aforesaid exclusive rights and privileges of your Orator, and has threatened to continue such infringing acts by making, using and selling Pistons in violation and infringement of your Orator's exclusive rights and privileges under said Letters Patent and to your Orator's great and irreparable loss and damage and contrary to equity and good conscience and to the manifest injury of your Orator in the premises.

XII.

That your Orator has caused notice to be given to the defendant of this aforesaid infringement of said Letters Patent, and each of them, and of the rights of your Orator in the premises, and requested the defendant to desist from such infringement; but that it has disregarded said notice and request and is continuing such infringement of said Letters Patent as aforesaid;

And forasmuch as your Orator can have no adequate relief except in this Court, and to the end therefor that the defendant may, if it can, shew cause why your Orator should not have the relief hereinafter prayed, and may make full disclosure of all the matters aforesaid, your Orator prays

1. That the said defendant, The National Piston Company, Incorporated, may be required to appear and [redacted] full, true, direct and perfect answer to the matters heretofore stated and charged, but not under oath, answer under oath being expressly waived.

2. That the said defendant, The National Piston Company, Incorporated, may be compelled to account for and pay over to your Orator the gains and profits which it has made and received, or shall have made and received, from said violation of your Orator's rights and from said infringement of the aforesaid Letters Patent, and each of them, and that your Honors may assess or cause to be assessed under your direction, in addition to the gains and profits to be accounted for by the defendant, the damages your Orator has sustained by reason of said infringement, and that your Honors may increase the actual damages to a sum equal to three times the amount of said assessment under the circumstances of the willful and unjust infringement of your Orator's Letters Patent by the said defendants as aforesaid.

3. That your Honor may grant unto your Orator a preliminary and also a perpetual writ of injunction, issuing out of and under the seal of this Honorable Court,

and directed to the said The National Piston Company, Incorporated, and enjoining it and its officers, agents, servants, attorneys and workmen and each of them, from making, using or vending or causing to be made, used or vended, or in any wise counterfeiting or imitating the inventions and improvements described and claimed in the aforesaid Letters Patent, or any part thereof, and from making, using or vending to others to be used or causing to be made, used or vended to others to be used, any Pistons, or any parts thereof, made in accordance with said Letters Patent, or any parts thereof, or like or similar to Pistons and parts thereof which the defendant has heretofore made and vended to others in violation of the rights of your Orator as aforesaid, and from any manner infringing said Letters Patent, or any of them, and that the Pistons and parts thereof embodying said patented inventions and improvements, or any part thereof, now in possession of the defendant or its agents or representatives, may be destroyed or delivered up to your Orator for that purpose.

4. That the said defendant, The National Piston Company, Incorporated, may be decreed to pay the costs of this suit, and that your Orator may have such other and further relief as the equity of the case may require and to your Honors may seem meet.

And may it please your Honors to grant unto your Orator a writ of injunction conformable to the prayer of this bill, and also a writ of subpoena of the United States of America, directed to the said The National Piston Company, Incorporated, commanding it to appear and make answer unto this bill of complaint and to abide and conform to such order and decree in the premises as to the Court shall seem meet and be required by the principles of equity and good conscience.

And your Orator will ever pray.

THE CLEVELAND TRUST COMPANY,
By F. H. HOBSON,
Vice-President.

Attest:

A. J. PEIFLER,
Ass't Trust Officer.

ROUNDS, SCHURMAN & DWIGHT,
Solicitors for Complainant.

EDWARD RECTOR,
Of Counsel.

STATE OF OHIO,
COUNTY OF CUYAHOGA, ss.

On this 17th day of July, 1923, before the undersigned, a Notary Public within and for the County and State aforesaid, personally appeared F. H. HOBSON and made oath that he is the Vice President of The Cleveland Trust Company, the above named complainant, that he has read the foregoing Bill of Complaint, and knows the contents thereof, and that the same is true, except as to those matters stated on information and belief, and as to those matters he believes it to be true.

ROY F. HAGGETT,
Notary Public.

(Seal)

IN THE UNITED STATES DISTRICT COURT
IN AND FOR THE SOUTHERN DISTRICT OF NEW YORK.

THE CLEVELAND TRUST COMPANY,
Plaintiff,
vs.
THE NATIONAL PISTON COMPANY, INCORPORATED,
Defendant.

IN EQUITY
No. 27-32.

ANSWER.

Defendant for its answer to the Bill of Complaint says:

I.

Defendant admits the allegation of Paragraph II of the Complaint, except that defendant denies that it has committed or is threatening to continue to commit any of the acts of infringement alleged in said complaint.

II.

Defendant denies each and every of the allegations of Paragraph IV of the Complaint, except that defendant admits that Letters Patent No. 1,092,870 were granted on the 14th day of April, 1914 to Edward O. Spillman and Louis P. Moores.

III.

Defendant denies any knowledge or information thereof sufficient to form a belief as to each and every of the allegations contained in Paragraphs V, VII, and IX of the Complaint herein.

IV.

Defendant denies each and every of the allegations of Paragraph VI of the Complaint, except that defendant admits that Letters Patent No. 1,279,184 were granted on the 7th day of September, 1918 to Packard Motor Car Company.

V.

Defendant denies each and every of the allegations of Paragraph VIII of the Complaint, except that defendant admits that Letters Patent No. 1,327,147 were granted on the 6th day of January, 1920 to Packard Motor Car Company.

VI.

Defendant denies each and every of the allegations of Paragraph X of the Complaint herein, except that defendant admits that Letters Patent No. 1,402,309 were granted on the 3rd day of January, 1922 to plaintiff, The Cleveland Trust Company.

VII.

Defendant denies each and every of the allegations of Paragraph XI of the Complaint herein, except that defendant admits notice of said Letters Patent of the United States and each of them.

VIII.

Defendant denies each and every of the allegations of Paragraph XII of the Complaint herein, except that defendant admits that plaintiff has caused notice to be given to the defendant of alleged infringement of said Letters Patent and each of them.

IX.

Upon information and belief defendant avers that said Letters Patent Nos. 1,092,870, 1,279,184, 1,327,147 and 1,402,309 are each invalid and void because the alleged invention described and claimed therein or substantial and material parts thereof had been patented and described in the following United States and foreign Letters Patent and printed publications prior to the alleged invention or discovery thereof by the alleged respective inventors named in each of said patents, and were known to and used by the patentees of said United States letters patent, whose residences are stated in their respective patents, at their said places of residences and elsewhere:

UNITED STATES PATENTS.

45,989,	Jan.	24,	1865,	Fuller,
258,884,	June	6,	1882,	Burritt,
289,019,	Nov.	27,	1883,	Nash,
289,693,	Dec.	4,	1883,	Nash,
305,467,	Sept.	23,	1884,	Murray, Jr.,
452,101,	May	12,	1891,	Ellithorpe,
511,651,	Dec.	26,	1893,	Roots,
548,772,	Oct.	29,	1895,	Bridges,
593,034,	Nov.	2,	1897,	Spacke,
627,707,	June	27,	1899,	Price,
630,838,	Aug.	15,	1899,	Anderson, et al.
677,135,	June	25,	1901,	Imler,
683,469,	Oct.	1,	1901,	Imler,
700,309,	May	20,	1902,	Ebbs,
753,527,	Mar.	1,	1904,	Stadel,
779,385,	Jan.	3,	1905,	Valentine,
920,165,	May	4,	1909,	Mareil,
975,301,	Nov.	8,	1910,	Tabot,
1,031,212,	July	2,	1912,	Van Bever,
1,061,756,	May	13,	1913,	Knight,
1,058,790,	Feb.	18,	1913,	Derby, et al.

FOREIGN PATENTS.

British,	17,754,	Aug.	17, 1898,	Pinkney,
German,	118,729,	Jan.	18, 1900,	Stuber,
British,	4,708,	Feb.	26, 1907,	Cockerill,
British,	11,518,	May	16, 1907,	Lake,
British,	17,256,	July	27, 1907,	Pugh,
German,	216,866,	Feb.	20, 1908,	Farsky,
British,	23,484,	Nov.	3, 1908,	Barth,
British,	11,077,	May	9, 1912,	Knowles,
German,	266,053,	Jan.	21, 1913,	Linnenbrugge.

X.

On information and belief defendant avers that said Letters Patent Nos. 1,327,147 and 1,403,309 are each invalid and void because the alleged invention described and claimed therein or substantial and material parts thereof had been patented and described in the following United States and foreign letters patent and printed publications prior to the alleged invention or discovery thereof by the respective alleged inventors, and were known to and used by the patentees of said United States Letters Patent, whose residences are stated in their respective patents, at their said places of residence and elsewhere:

UNITED STATES PATENTS.

1,129,393,	Feb. 23, 1915,	Huff,
1,139,396,	May 11, 1915,	Barthel,
1,160,727,	Nov. 16, 1915,	Lemp.

FOREIGN PATENTS

French,	468,595,	July 9, 1914,	Societe Anonyme,
British,	6,015,	March 10, 1914,	Austom Motor Co.
French,	480,644,	Aug. 31, 1916,	Societe Anonyme.

XI.

Upon information and belief defendant avers that said Letters Patent No. 1,402,309 are invalid and void because the alleged invention described and claimed therein or substantial and material parts thereof had been patented and described in the following United States and foreign letters patent and printed publications prior to the alleged invention or discovery thereof by said Louis P. Mooers, and were known to and used by the patentees of said United States letters patent, whose residences are stated in their respective patents, at their said places of residence and elsewhere:

U. S. Patent No. 1,114,229, Oct. 20, 1914, M. G. Chandler,
French " " 480,644, Jan. 10, 1916, Delaney.

XII.

Upon information and belief defendant avers that said Letters Patent Nos. 1,092,870, 1,279,184, 1,327,147 and 1,402,309 are invalid and void because the alleged inventions and improvements attempted to be patented thereby did not at the respective dates of the applications for said letters patent, or at the respective times of the said alleged invention thereof, involve or require invention; that, in view of the state of the art as it existed at that time, it did not involve the exercise of the inventive faculty to devise and produce the apparatus described and claimed respectively in said letters patent but merely the exercise of mechanical skill, and that none of the alleged inventions of said letters patent produced any new and useful result not already known to others and in common use by others skilled in the art prior to the respective dates of application for said letters patent and prior to the alleged invention thereof by the respective applications for said letters patent.

XIII.

Upon information and belief defendant avers that the alleged inventions respectively said to be described and claimed in said Letters Patent Nos. 1,092,870, 1,279,184, 1,327,147 and 1,402,309 were subsequent to the grant of said respective letters patent and each of them, had been prior thereto, notoriously and continuously and openly used by the public, including this defendant, with full knowledge of the plaintiff and in violation of its alleged rights under said Letters Patent Nos. 1,092,870, 1,279,184, 1,327,147 and 1,402,309, but without interference by it from the date of the grant of said respective letters patent to a time just prior to the filing of the complaint herein, by which conduct plaintiff and its predecessors in title to said Letters Patent Nos. 1,092,870, 1,279,184, 1,327,147 and 1,402,309, acquiesced in the use now alleged to be an infringement and abandoned the inventions to the public and led the trade and the public generally into the belief that the said alleged inventions had been abandoned to the public; and defendant alleges that plaintiff has been guilty of laches in the premises and that the complaint herein is without equity and that plaintiff is estopped from now asserting its alleged rights in said Letters Patent Nos. 1,092,870, 1,279,184, 1,327,147 and 1,402,309, and each of them, against this defendant, particularly as to any acts of infringement prior to the filing of the bill of complaint herein.

Wherefore this defendant prays that the bill of complaint be dismissed with costs.

Gifford, Bull & Scull,
Solicitors for Defendant.

George F. Scull,
Of Counsel.

September 15, 1923.

IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK.

THE CLEVELAND TRUST COMPANY
vs.
THE NATIONAL PISTON COMPANY, INC.
} IN EQUITY No. 27-32.

FINAL DECREE.

This cause having come on to be heard at this term upon the consent of the parties to the entry of this decree and thereupon in consideration thereof, it is ordered, adjudged and decreed as follows:

FIRST: That Letters Patent to Edward O. Spillman and Louis P. Mooers, No. 1,092,870, April 14th, 1914 for Pistons for Explosion Engines or Motors is good and valid in law;

SECOND: That the said Edward O. Spillman and Louis P. Mooers are the true and original inventors of the invention and improvements described and claimed in said Letters Patent;

THIRD: That Letters Patent to Jesse G. Vincent No. 1,279,184, Sept. 17, 1918, for Pistons is good and valid in law;

FOURTH: That the said Jesse G. Vincent is the true and original inventor of the inventions and improvements described in said Letters Patent;

FIFTH: That Letters Patent to Harold D. Church, No. 1,327,147, Jan. 6th, 1920, for Hydro-Carbon Motor is good and valid in law;

SIXTH: That the said Harold D. Church is the true and original inventor of the inventions and improvements described in said Letters Patent;

SEVENTH: That Letters Patent to Louis P. Mooers, No. 1,402,309, Jan. 3rd, 1922, for Pistons for Internal Combustion Motors is good and valid in law;

EIGHTH: That the said Louis P. Mooers is the true and original inventor of the inventions and improvements described in said Letters Patent;

NINTH: That the said The Cleveland Trust Company, the Plaintiff, is the lawful owner of said patents and each of them;

TENTH: That the Defendant has infringed upon the said Letters Patent, and each of them, and upon the exclusive rights of the Plaintiff under the same by the manufacture, use and sale of Pistons.

ELEVENTH: Accounting having been waived, no accounting is ordered.

TWELFTH: That a perpetual injunction issue out of and under the seal of this court directed to the said Defendant, its associates, directors, officers, attorneys, clerks, agents, servants, workmen and others employed enjoining and restricting them and each of them, from directly or indirectly making or causing to be made, using or causing to be used or vending to others to be used in any manner, any article, device, apparatus or piston containing, embodying or employing the said inventions or improvements, or any of them covered by the said Letters Patent, or of any piston capable of or adapted to be used in infringement of said patents, or either of them, or from infringing upon or violating the said Letters Patent or either of them in any way whatsoever without the license of the owner or owners present or future of said patents.

THIRTEENTH: No costs are taxed.

FOURTEENTH: The parties having waived appeal, no petition for appeal will be entertained and no order for appeal will be allowed.

F. A. WINSLOW,
United States District Judge.

We consent to the entry of the above decree.

EDWARD R. ALEXANDER,
Counsel for Plaintiff.

GIFFORD & SCULL,
Counsel for Defendant.

DEFENDANTS' EXHIBIT 4-Z.

Bill of Complaint in Case No. 535 in the United States District Court for the Eastern District of Michigan, The Cleveland Trust Company vs. E. C. Long Piston Company and E. C. Long.

(Filed January 27, 1934.)

IN THE UNITED STATES DISTRICT COURT

IN AND FOR THE EASTERN DISTRICT OF MICHIGAN.

THE CLEVELAND TRUST COMPANY, *Plaintiff*, vs. E. C. LONG PISTON COMPANY and E. C. LONG, *Defendants.*	IN EQUITY No. 535.

BILL OF COMPLAINT.

To the Honorable Judges of the United States District Court for the Eastern District of Michigan:

The Cleveland Trust Company, a corporation organized and existing under and by virtue of the laws of the State of Ohio, and having its principal office and place of business at Cleveland in said State, brings this bill of complaint against E. C. Long Piston Company, a corporation organized and existing under and by virtue of the laws of the State of Michigan, and E. C. Long, a resident of Detroit, Michigan and a citizen of said State, both having a regular, established and joint place of business at Detroit in the State of Michigan, within the aforesaid Eastern District of Michigan, and thereupon your Orator complains and says:

I.

That your Orator, The Cleveland Trust Company, is a corporation duly organized and existing under and by virtue of the laws of the State of Ohio, and has its principal office and place of business in Cleveland in said State.

II.

That the defendant, E. C. Long Piston Company, is a corporation duly organized and existing under and by

virtue of the laws of the State of Michigan, and the defendant, E. C. Long, is a resident and citizen of the State of Michigan, and both have a regular, established and joint place of business and principal office at Detroit in the State of Michigan, within the aforesaid Eastern Judicial District of Michigan, where they, and each of them, have committed the acts of infringement hereinafter set forth.

III.

That the jurisdiction of the Court in this cause is based upon the fact that the suit is one touching patent rights, and is brought to restrain infringement of certain Letters Patent owned by the plaintiff, and for an accounting of profits and damages arising from past infringement of said Letters Patent by the defendants.

IV.

That heretofore and before the 18th day of July, 1913, Edward O. Spillman and Louis P. Mooers, citizens of the United States, residing in the County of Niagara, State of New York, were the original, first and joint inventors of certain new and useful improvements in Pistons for Explosion Engines or Motors, fully described in Letters Patent of the United States No. 1,092,870, hereinafter mentioned, which invention or improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country, prior to their invention thereof, or more than two years prior to their application for said Letters Patent, and had not been in public use or on sale in this country for more than two years prior to said application, and had not been abandoned to the public, and had not been patented or caused to be patented by them or their legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of their application for Letters Patent of the United States therefor; that the said Edward O. Spillman and Louis P. Mooers made due application to the Commissioner of Patents of the United States in accordance with the then existing acts of Congress, for Letters Patent of the United States for said invention or improvement, and having in all respects complied with the conditions and requisitions of said acts of Congress, on the 14th day of April, 1914, Letters Patent of the

United States No. 1,092,870, signed, sealed and executed in due form of law, for the said invention or improvement were issued and delivered unto said Edward O. Spillman and Louis P. Mooers, whereby there was secured unto them, their successors and assigns for the term of seventeen years from the said 14th day of April, 1914, the sole and exclusive right to make, use and sell to others to be used, throughout the United States and the territories thereof the aforesaid invention or improvement, all as by said Letters Patent, or a duly authenticated copy thereof in Court to be produced and shown unto your Honor, will more fully and at large appear.

V.

That subsequent to the granting of the aforesaid Letters Patent, namely, on or about the 16th day of June, 1916, by an instrument in writing, one George B. Pitts acquired from said Edward O. Spillman and The Herschel Spillman Company, a corporation of the State of New York, the undivided one half of the entire right and interest in, to and under said Letters Patent of the United States No. 1,092,870, said assignment having been duly recorded on the 5th day of September, 1916 in Liber R-101, page 1 of the Transfers of Patents; that thereafter and on or about the 3rd day of July, 1919 the said George B. Pitts by an instrument in writing assigned said undivided one half of the entire right, title and interest in, to and under said Letters Patent No. 1,092,870, to your Orator, The Cleveland Trust Company, which assignment was duly recorded on the 28th day of July, 1919 in Liber Q-107, page 336 of the Transfers of Patents; and that the said Louis P. Mooers on the 10th day of July, 1919, by an instrument in writing assigned the undivided one half of the entire right, title and interest in, to and under said Letters Patent No. 1,092,870 to your Orator, The Cleveland Trust Company, which assignment was duly recorded on the 28th day of July, 1919, in Liber Q-107, page 339 of the Transfers of Patents; whereby your Orator became vested with and holds the entire right, title and interest in, to and under said Letters Patent No. 1,092,870, as will more fully and at large appear upon production in Court of the assignments aforesaid.

VI.

That heretofore and before the 22nd day of October, 1913, Jesse G. Vincent, a citizen of the United States, and resident of Detroit, Wayne County, State of Michigan, was the original, first and true inventor of certain new and useful improvements in Pistons, fully described in Letters Patent of the United States No. 1,279,184, hereinafter mentioned, which invention or improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his application for said Letters Patent; had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States therefor; that the said Jesse G. Vincent made due application to the Commissioner of Patents of the United States in accordance with the then existing acts of Congress, for Letters Patent of the United States for said invention and improvement, and by an instrument in writing duly executed and delivered by him, and duly recorded in the Patent Office of the United States, assigned and transferred the entire right, title and interest in and to said invention and improvement and in and to said application for Letters Patent, to Packard Motor Car Company, a corporation organized and existing under the laws of the State of Michigan, and authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for the said invention and improvement to the said Packard Motor Car Company, and having in all respects complied with the conditions and requisitions of said acts of Congress, on the 17th day of September, 1918, Letters Patent of the United States No. 1,279,184, signed, sealed and executed in due form of law for the said invention and improvement were issued and delivered unto said Packard Motor Car Company, as assignee of the said Jesse G. Vincent, whereby there was secured unto said Packard Motor Car Company, and its successors and assigns for the term of seventeen years from the said 17th day of September, 1918, the sole and exclusive right to make, use and vend to others to be used, throughout the United States and

the territories thereof, the aforesaid invention and improvement; all as by said Letters Patent, or a duly authenticated copy thereof in Court to be produced and shown unto your Honors, will more fully and at large appear.

VII.

That subsequent to the granting of the aforesaid Letters Patent, namely on or about the 11th day of September, 1922, by an instrument in writing said Packard Motor Car Company assigned the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,279,184 to your Orator, The Cleveland Trust Company, which assignment was duly recorded on the 18th day of September, 1922, in Liber W-117 page 44 of the Transfers of Patents; whereby your Orator became vested with and holds the entire right, title and interest in, to and under said Letters Patent No. 1,279,184, as will more fully and at large appear upon production in Court of the assignment aforesaid.

VIII.

That heretofore and before the 11th day of May, 1916, Harold D. Church, a citizen of the United States and a resident of Detroit, Wayne County, State of Michigan, was the original, first and true inventor of certain new and useful improvements in Hydro-Carbon Motor, fully described in Letters Patent of the United States No. 1,337,147, hereinafter mentioned, which invention or improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to, his application for said Letters Patent, and had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public; and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent in the United States therefor; that the said Harold D. Church made due application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress, for Letters Patent of the United States for said invention and improvement, and by an instrument in writing duly

executed and delivered by him, and duly recorded in the Patent Office of the United States, assigned and transferred the entire right, title and interest in and to said invention and improvement and in and to said application for Letters Patent to Packard Motor Car Company, a corporation organized and existing under the laws of the State of Michigan, and authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for said invention and improvement to the said Packard Motor Car Company, and having in all respects complied with the conditions and requisitions of said Acts of Congress, on the 6th day of January, 1920 Letters Patent of the United States No. 1,327,147, signed, sealed and executed in due form of law for the said invention and improvement were issued and delivered unto said Packard Motor Car Company, as assignee of said Harold D. Church, whereby there was secured unto said Packard Motor Car Company and its successors and assigns for the term of seventeen years from the 6th day of January, 1920, the sole and exclusive right to make, use and vend to others to use throughout the United States and the territories thereof, the aforesaid invention and improvement; all as by said Letters Patent, or a duly authenticated copy thereof in Court to be produced and shown unto your Honors will more fully and at large appear.

IX.

That subsequent to the granting of the aforesaid Letters Patent, namely on or about the 11th day of September, 1922, by an instrument in writing, said Packard Motor Car Company assigned the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,327,147 to your Orator, The Cleveland Trust Company, which assignment was duly recorded on the 18th day of September, 1922, in Liber C-117 page 64 of the Transfers of Patents; whereby your Orator became vested with and holds the entire right, title and interest in, to and under said Letters Patent No. 1,327,147, as will more fully and at large appear upon production in Court of the assignment aforesaid.

X.

That heretofore and before the 2nd day of June, 1917, Louis P. Mooers, a citizen of the United States, residing at Cincinnati, Hamilton County, State of Ohio,

was the original, first and true inventor of certain new and useful improvements in Pistons for Internal Combustion Motors, fully described in Letters Patent of the United States No. 1,402,309, hereinafter mentioned, which invention or improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his application for said Letters Patent; had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States therefor; that the said Louis P. Mooers made due application to the Commissioner of Patents of the United States in accordance with the then existing acts of Congress, for Letters Patent of the United States for said invention and improvement and by an instrument in writing duly executed and delivered by him and duly recorded in the Patent Office of the United States in Liber P-103, page 133 of the Transfers of Patent, assigned an undivided half of the entire right, title and interest in, and to said invention and improvement and in and to said application for Letters Patent to George B. Pitts of Cleveland, Ohio, and authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for said invention and improvement to said George B. Pitts and Louis P. Mooers; and by said instruments in writing specified in Article V of this bill as recorded in Liber Q-107, pages 338 and 339 of the Transfer of Patents, said George B. Pitts and Louis P. Mooers, respectively, each assigned an undivided one-half of the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,402,309 to your Orator, The Cleveland Trust Company, and authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for said invention and improvement to said The Cleveland Trust Company, whereby your Orator became vested with and holds the entire right, title and interest in, to and under said Letters Patent No. 1,402,309, as will more fully and at large appear upon production in Court of the said Letters Patent and the assignments aforesaid.

XI.

And your Orator further avers and shows unto your Honors that the said defendants, E. C. Long Piston Company and E. C. Long, as your Orator is informed and believes, having due and timely notice of said Letters Patent of the United States, and each of them, and well knowing the premises and the exclusive rights and privileges as aforesaid secured to your Orator by the said Letters Patent, but contriving and planning to injure your Orator and deprive it of the profits, benefits, and advantages which would have otherwise accrued to your Orator from the said Letters Patent have been since the grant of each of the Letters Patent aforesaid, and still are in the said Eastern District of Michigan, unlawfully, wrongfully, and without license or permission of your Orator, manufacturing, or causing to be manufactured, using and selling Pistons constructed according to and containing the aforesaid inventions, discoveries or improvements patented by said Letters Patent in violation and infringement of the aforesaid exclusive rights and privileges of your Orator, and have threatened to continue such infringing acts by making, using and selling Pistons in violation and infringement of your Orator's exclusive rights and privileges under said Letters Patent and to your Orator's great and irreparable loss and damage and contrary to equity and good conscience and to the manifest injury of your Orator in the premises.

XII.

That your Orator has caused notice to be given to the defendants, and each of them, of this aforesaid infringement of said Letters Patent, and each of them, and of the rights of your Orator in the premises, and requested the defendants, and each of them, to desist from such infringement; but that they and each of them have disregarded said notice and request and are continuing such infringement of said Letters Patent as aforesaid;

And forasmuch as your Orator can have no adequate relief except in this Court, and to the end therefor that the defendants may, if they can, show cause why your Orator should not have the relief hereinafter prayed, and may make full disclosure of all the matters aforesaid, your Orator prays

1. That the said defendants, E. C. Long Piston Company and E. C. Long, may be required to appear and make full, true, direct and perfect answer to the matters

heretofore stated and charged, but not under oath, answer under oath being hereby expressly waived.

2. That the said defendants, E. C. Long Piston Company and E. C. Long, may be compelled to account for and pay over to your Orator the gains and profits which they, and each of them, have made and received, or shall have made and received, from said violation of your Orator's rights and from said infringement of the aforesaid Letters Patent, and each of them, and that your Honors may assess or cause to be assessed under your direction, in addition to the gains and profits to be accounted for by the defendants, the damages your Orator has sustained by reason of said infringement, and that your Honors may increase the actual damages to a sum equal to three times the amount of said assessment under the circumstances of the willful and unjust infringement of your Orator's Letters Patent by the said defendants as aforesaid.

3. That your Honors may grant unto your Orator a preliminary and also a perpetual writ of injunction, issuing out of and under the seal of this Honorable Court, and directed to the said E. C. Long Piston Company and E. C. Long, and enjoining it and him, and its and his officers, agents, servants, attorneys and workmen, and each of them, from making, using or vending or causing to be made, used or vended, or in any wise counterfeiting or imitating the inventions and improvements described and claimed in the aforesaid Letters Patent, or any part thereof, and from making, using or vending to others to be used, or causing to be made, used or vended to others to be used, any Pistons, or any parts thereof, made in accordance with said Letters Patent, or any part thereof, or like or similar to Pistons and parts thereof which the defendant has heretofore made and vended to others in violation of the rights of your Orator as aforesaid, and from and in any manner infringing said Letters Patent, or any of them, and that the Pistons and parts thereof embodying said patented inventions and improvements, or any part thereof, now in possession of the defendants, or either of them or their agents or representatives, may be destroyed or delivered up to your Orator for that purpose.

4. That the said defendants, E. C. Long Piston Company and E. C. Long, may be decreed to pay the costs of this suit, and that your Orator may have such other and further relief as the equity of the case may require and to your Honors may seem meet.

And may it please your Honors to grant unto your Orator a writ of injunction conformable to the prayer of this bill, and also a writ of subpoena of the United States of America, directed to the said E. C. Long Piston Company and E. C. Long, commanding it and him, respectively, to appear and make answer unto this bill of complaint and to abide and conform to such order and decree in the premises as to the Court shall seem meet and be required by the principles of equity and good conscience.

And your Orator will ever pray.

THE CLEVELAND TRUST COMPANY,
By R. A. MALM,
Vice President.

ATTEST:—

A. J. PERFLER,
Asst. Trust Officer.

.....,
Solicitor for Complainant.

R. T. SAWYER,
Of Counsel.

STATE OF OHIO,
COUNTY OF CUYAHOGA, SS.

On this 6th day of April, 1923, before the undersigned a Notary Public within and for the County and State aforesaid, personally appeared R. A. MALM and made oath that he is the Vice President of The Cleveland Trust Company, the above named complainant, that he has read the foregoing Bill of Complaint, and knows the contents thereof and that the same is true, except as to those matters stated on information and belief, and as to those matters he believes it to be true.

.....
Notary Public.

(Notarial Seal)

FILED
JAN 27 1934
F. J. OENZLER, Clerk
U. S. District Court N. D. O.

30

2271

E-C-L Pistons

Run With Less Clearance

Have Cast Iron Pistons

E. C. LONG

JAN 27 1934
O'clock
F. J. GENILER Clerk
S. District Court N. D. O.

Runs With Less Clearance Than Cast Iron Pistons—

—and so does

MANY of America's automobile manufacturers have adopted E. C. L. corresponding clearances when they specify aluminum pistons because they run with less clearance than cast iron pistons and consequently reduce the amount of "slap" and noise when the motor is cold.

E. C. L. Non-X Pistons quickly reduce the clearance of gas and oil and increase the power and speed of the motor. They run cooler, reduce vibration and wear on bearings and insure quick hookups.

E. C. L. Non-X Pistons are practically thrown from light-weight Aluminum Alloy. They may be fitted quickly and easily to any motor with very little alteration. The piston is furnished with three suitable grooves for the proper location of the lower part of the piston. The piston heads are machined to a smaller size than the skirt of the piston so that none of the excessive expansion of the head, which does not interfere with the running fit of the piston. This insures a perfect fit at all times.

Install a set of E. C. L. Non-X Pistons in your next overhaul job and note how smoothly the motor runs—how quiet and responsive. Note the reduction in vibration and the elimination of the so-called "piston slap." Start the motor cold and see how splendidly it runs and how quickly it responds. There are all factors which will appeal to every motorist—especially those who are driving last year's cars or the year before. Add you can capitalize the factor in your selling talk.

E. C. L. Non-X Pistons are carried in stock for standard cold conditions for practically all makes of motors.

We will gladly tell you more about the profitable opportunities with E. C. L. Non-X Pistons. Write us at once for complete information.

E. C. LONG
Motor Service and Machine
4634 Dodds Blvd, Duluth, Minn.

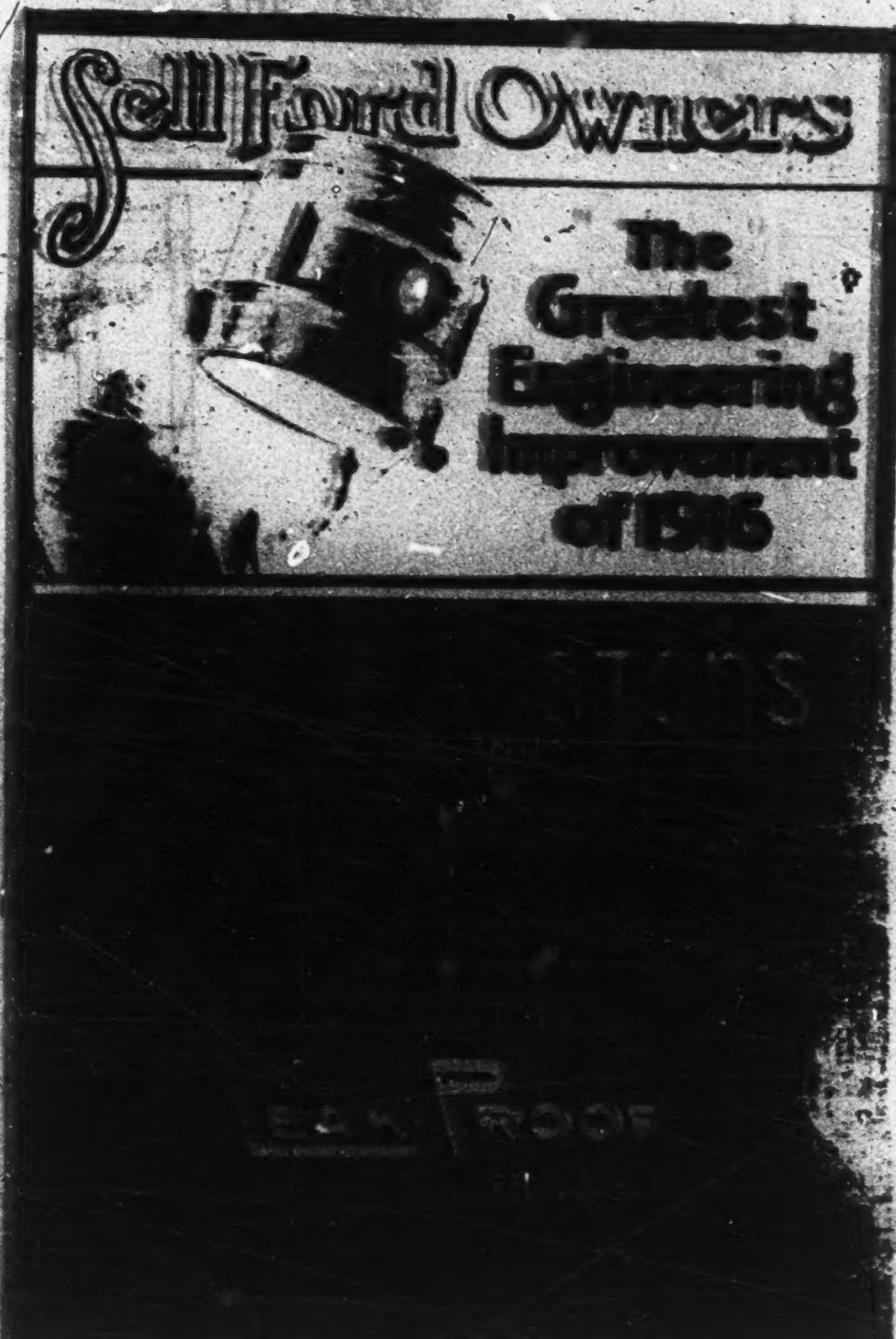
E-C-L Pistons

INDEPENDENT SERVICE OIL

Page 270 of "Motor World" for December 28, 1933.
(Week January 27, 1934.)

OUTSTANDING

DEFENDANTS' EXHIBIT 6-D.
Page 133 of "Automobile Trade Journal" April 1916.
(Filed January 27, 1934.)



Runs With Less Clearance
Than Cast Iron Pistons

Sell Ford Owners
The Greatest
of 1916

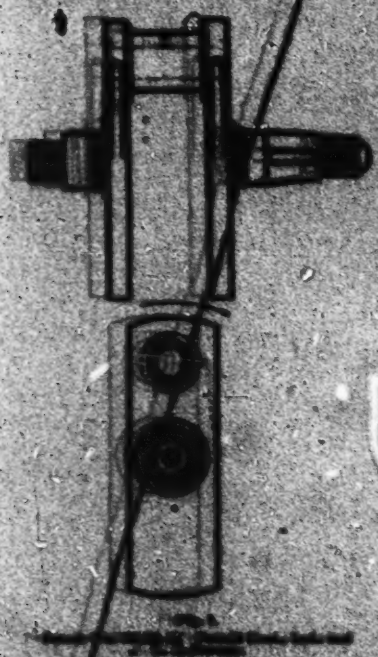
DEFENDANTS' EXHIBIT 1-D.
Page 178 of "Automobile Trade Journal" April 1914.
(Filed January 27, 1916.)

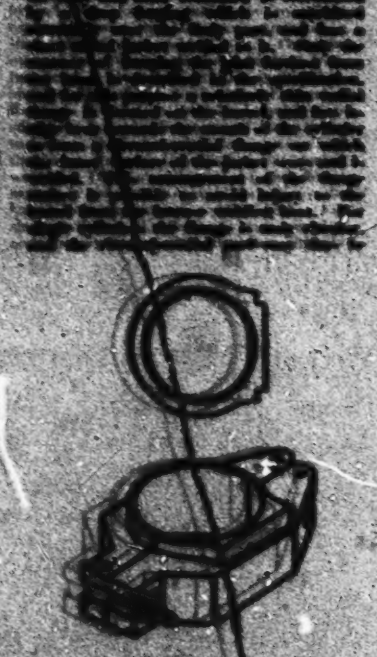
Sell Ford Owners

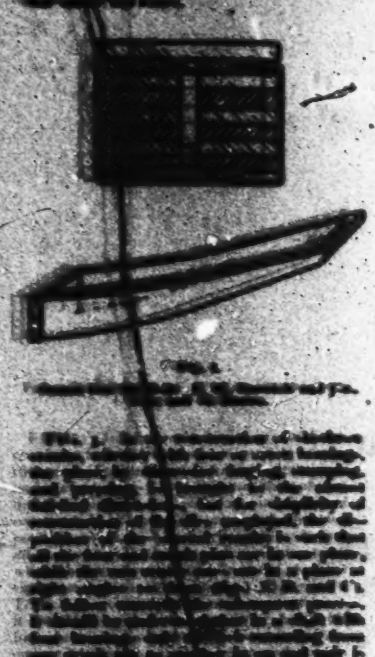
The
Greatest
Engineering
Improvement
of this

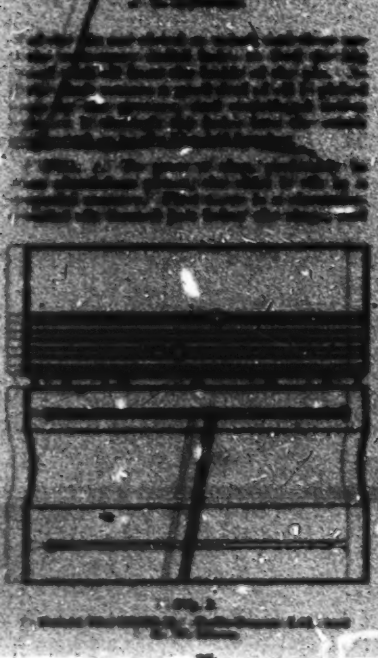
30

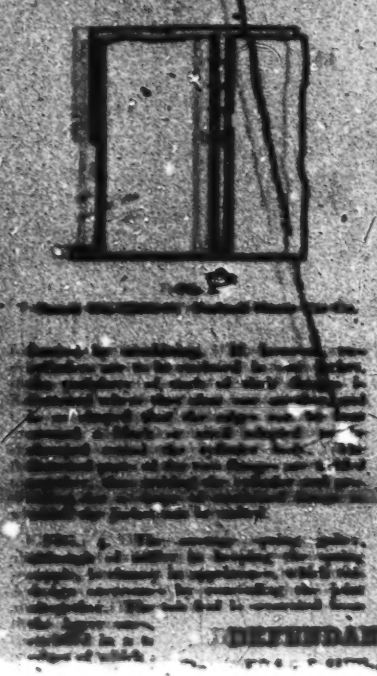
THE TREND OF INVENTION

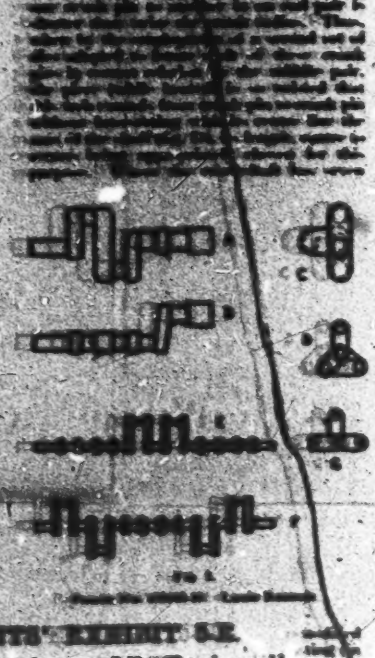




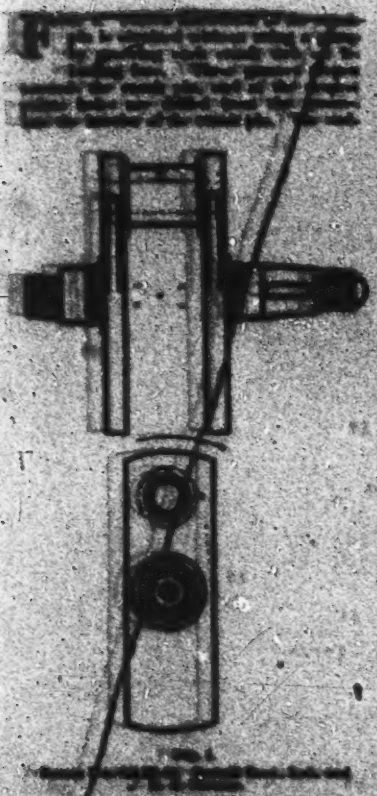


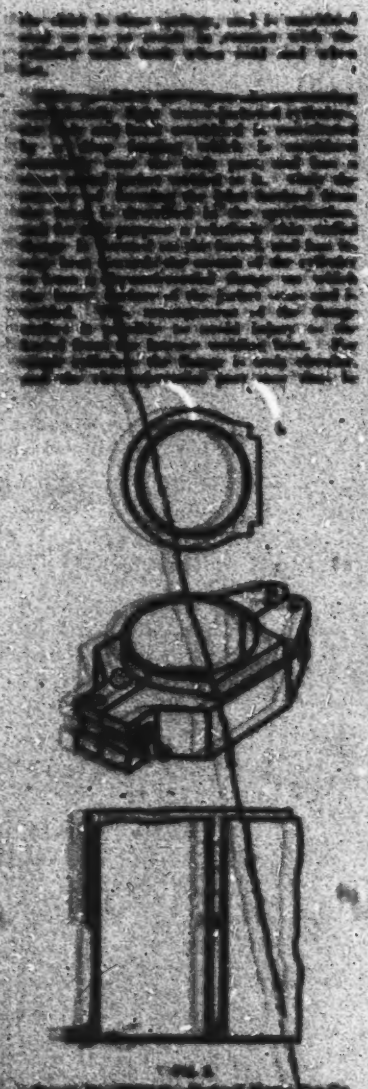






DEFENDANTS' EXHIBIT 58





DEFENDANTS' EXHIBIT 5-K.

Page 304 of "The Automobile Engineer" for December 1920.

(Filed January 27, 1934.)

Defendants' Exhibit 5-F. To face page 2277

DEFENDANTS' EXHIBIT 5-F.

Cut to Accompany Stipulated Digest of Same.

MUSCHENHEIM, DEAVER, FIELDING IN KANE COUNTY RACE

DEFENDANTS' EXHIBITS 5-F_1 TO 5-F_{12}.

Digest of Defendants' Exhibit 5-F_1.

(Motor Age, August 24, 1911, pages 3 and 5.)

List of Entries for Elgin Race Includes No. 27 G. Monckmeier, Staver Chicago, Model 1912.

Article includes picture of Monckmeier in Staver automobile and also picture of Ralph Ireland. Comment is also made with reference to the injuries of Ireland, suffered during practice for the races, and which resulted in his death.

Digest of Defendants' Exhibit 5-F_2.

(Motor Age, August 31, 1911, pages 10, 12 and 15.)

Article includes, picture of automobile with number "27" on radiator, beneath which is the following:

"Monckmeier, Staver, Finisher in Kane County Race,"

and a table showing the result of the race and including the name of G. Monckmeier, Staver-Chicago.

Digest of Defendants' Exhibit 5-F_3.

(The Automobile, October 13, 1911, page 643.)

Article, dated October 9, mentions a Staver-Chicago car driven by Monckmeier as participating in four races at Springfield, Illinois.

Digest of Defendants' Exhibit 5-F_4.

(Motor Age, October 12, 1911, page 10.)

Article, dated October 9, with reference to racing in Springfield, Illinois, mentions the participation of Monckmeier driving a Staver-Chicago in four races.

Digest of Defendants' Exhibit 5-F_5.

(The Automobile, October 19, 1911, page 687.)

With reference to racing at Peoria, Illinois, October 14, Monckmeier driving a Staver-Chicago, Listed in four races.

Digest of Defendants' Exhibit 5-F_6.

(The Automobile, November 16, 1911, page 853.)

Racing in San Antonio, Texas, November 13. Monckmeier listed as engaging in four races.

Digest of Defendants' Exhibit 5-F_7.

(Motor Age, November 16, 1911, page 15.)

Article, dated November 13, with reference to racing at San Antonio, Texas—Monckmeier listed as engaging in four races and driving a Staver-Chicago.

Digest of Defendants' Exhibit 5-F_8.

(Motor Age, December 14, 1911, pages 4 and 7.)

The name of Monckmeier driving a Staver-Chicago included in a list of averages made by various racers during 1911. G. Monckmeier driving a Staver-Chicago also listed as a participant in the Kane County Cup Race, Elgin, Illinois.

Digest of Defendants' Exhibit 5-F_9.

(Motor Age, October 16, 1913, page 21.)

With reference to racing at Springfield, Illinois, October 4, Monckmeier listed as driving a Staver-Chicago and participating in four races.

Digest of Defendants' Exhibit 5-F_{10}.

(Motor Age, December 4, 1913, page 24.)

Article, dated November 27, lists Monckmeier as participating in a race at San Antonio, Texas.

Digest of Defendants' Exhibit 5-F_{11}.

(The Peoria Star, Peoria, Illinois, September 27, 1913.)

Monckmeier, driving a Staver-Chicago, finished second in three races and first in another, setting a new State record in the latter.

Digest of Defendants' Exhibit 5-F_{12}.

(The Peoria Star, Peoria, Illinois, July 5, 1914.)

Monckmeier driving a Staver listed as participating in races.

DEFENDANTS' EXHIBIT 5-G.

Digest of Defendants' Exhibit 5-G.

(Certificate from Secretary of State for State of Illinois.)

This certificate shows that Staver Motor Car Company, located at 527 West 76th Street, Auburn Park, Chicago, was incorporated on August 29, 1913, and that the corporation was dissolved on January 31, 1928.

DEFENDANTS' EXHIBITS 5-H_1 to 5-H_3.

Digest of Defendants' Exhibit 5-H_1.

(Decision of Law Examiner in the United States Patent Office, dated May 23, 1921, in Hartog v. Pomeroy Interference No. 45,351.)

Decision denies Motion to Dissolve brought by Pomeroy.

Digest of Defendants' Exhibit 5-H_2.

(Decision of Examiner of Interferences in the United States Patent Office, dated February 17, 1922, in Hartog v. Pomeroy Interference No. 45,351.)

Decision awards priority of invention of the subject matter in issue to Pomeroy.

Digest of Defendants' Exhibit 5-H_3.

(Decision of the Board of Appeals in the United States Patent Office, dated August 10, 1922, Hartog v. Pomeroy Interference No. 45,351.)

This decision reverses the decision of the Examiner of Interferences on the question of priority and awards priority of invention to Hartog.

DEFENDANTS' EXHIBIT 5-I.

Digest of Defendants' Exhibit 5-I.

(Includes Items from Exhibits Identified as V-1, V-2 and V-4.)

EXHIBIT V-1—CASH DISBURSEMENTS

1919			
November	10	Walker M. Levitt Co.	$164.03
November	19	Walker M. Levitt Co.	67.50
November	28	Walker M. Levitt Co.	316.33
December	6	Walker M. Levitt Co.	243.13
December	6	E. C. Long—Royalties for sale pistons	27.40
December	8	Walker M. Levitt Co.	31.56
December	12	Walker M. Levitt Co.	76.61
December	18	E. C. Long—for moneys received on F. Motor Car Co., Chic.	720.07
1920			
January	6	E. C. Long—Royalties	$ 24.00
January	10	Walker M. Levitt Co.	57.04
January	15	Walker M. Levitt Co.	80.33
January	19	E. C. Long	49.92
January	22	E. C. Long	99.49
January	22	Walker M. Levitt Co.	108.00
January	27	Walker M. Levitt Co.	101.25
January	29	Walker M. Levitt Co.	149.51
February	5	Walker M. Levitt Co.	206.38
February	5	Walker M. Levitt Co.	199.80
February	7	E. C. Long—Royalty	80.60
February	9	Walker M. Levitt Co.	249.42
March	3	E. C. Long—Royalty	127.80
March	4	Walker M. Levitt Co.	319.28
March	6	Walker M. Levitt Co.	668.99
April	9	E. C. Long	157.60
May	10	E. C. Long—Royalty	106.40
June	8	E. C. Long—Royalties	138.40
July	8	E. C. Long	117.80
August	2	Walker M. Levitt Co.	1036.13
August	7	E. C. Long	96.40
Sept.	10	E. C. Long	151.60
Oct.	8	Walker M. Levitt Co.	136.54
Oct.	9	E. C. Long	87.20
October	11	Walker M. Levitt Co.	100.58
Nov.	10	E. C. Long	103.40
Dec.	2	Walker M. Levitt Co.	273.38
Dec.	10	E. C. Long	69.20

1921			
January	10	—E. C. Long.....	$71.80

DEFENDANTS' EXHIBIT V-2—SALES—PISTONS

1919			
November	29	—Sales during November.....	1006.95
December	26	—6 Pistons returned from Franklin Sales Co., Streator, Ill.	44.10
December	26	—32 Pistons returned from Franklin Motor Car Co., Chicago, Ill.	249.90
December	26	—6 Pistons returned from Franklin Motor Car Co., Chicago....	44.10
December	31	—6 Pistons returned from Dixie Motor Sales Co., Memphis, Tenn.	44.10
December	31	—Sales during December	1381.80
1920			
January	31	—Sales during January	2274.00
January	31	—6 Pistons returned from Franklin Ross Motor Car Co., St. Louis	44.10
February	28	—Sales during February	4021.65
March	31	—Sales returned during March..	88.20
March	31	—Sales returned from Billings, Mont.	7.35
March	31	—Sales Pistons March	4533.42
April	1	—Returned from Franklin Motor Car Co., Chicago	44.10
April	5	—Returned from Franklin Motor Car Co., Chicago	31.50
April	10	—Returned from Holmes, Canton, Ohio	172.12
April	10	—Returned from Holmes, Canton, Ohio	137.70
April	10	—Returned from Holmes, Canton, Ohio	309.83
April	19	—Returned from Norman Gratz, Canton, Ohio	12.60
April	20	—Returned from Franklin Motor Car Co., Chicago	37.80
April	30	—Sales—April	3991.48
May	31	—2 Pistons returned from Franklin Motor Car Co., Chicago....	12.60

1920—Continued

May	31—1 Piston returned from Drescher, Oak Park	$7.65
	3 Pistons returned from Franklin Motor Car Co., Chi.	18.90
May	31—Sales—May	4071.71
June	3—6 Pistons to be done over—returned from Horton, Kansas	37.80
June	7—96 Pistons to be done over—returned from Holmes, Canton	550.80
June	25—22 Pistons returned to be done over for Holmes, Canton, O.	126.23
June	23—24 Pistons returned to be done over for Holmes, Canton, O.	137.70
June	30—6 Pistons returned from Horton, Kansas	37.80
June	30—Sales—June	4814.88
July	1—1 Piston from Holmes, St. Paul	8.10
July	6—1 Piston from F. M. Car Co., Chicago, Ill.	6.30
July	9—1 Piston from Franklin Sherwood Company	6.30
July	3—6 Pistons from South Side Garage	37.80
July	27—2 Pistons from Franklin Motor Car Co., Chicago	12.60
July	31—6 Pistons from F. B. Heathman & Company	37.80
July	31—1 Piston from Chappel Bros.	7.50
July	31—Sales Pistons Sales Book July	3566.69
August	31—Return Sales—Pistons	86.40
August	31—Return Sales—Pistons	101.70
August	31—Sales Pistons	3497.04
September	30—Sales Pistons—September Summary	3037.05
October	30—Sales Book Summary—Oct.	2608.26
November	30—Sales Book Summary	2210.68
December	31—6 Pistons returned from Wilson M. S. Co.	37.80
December	31—2 Pistons returned from E. T. Byram	11.20
December	31—14 Pistons returned from Franklin Motor Car Co., Chicago, Ill.	78.40
December	31—Sales Book Summary—December	2094.09

1921			
January	31	Return Sales, Barr & B Garage, Salina, Kansas	$37.80
January	31	Sales Book Summary	2713.91
February	11	Return Sales Cramer Motor Car Co.	40.00
February	28	Sales Book Summary	1603.58
March	31	Sales Book Summary	2999.92
April	30	Sales Book Summary	3397.89
April	22	Return Sales W. I. Elliott Co.	5.55
May	31	Sales Book Summary	2232.90
June	30	Sales Book Summary	2131.38
July	30	Sales Book Summary	1789.62

DEFENDANTS' EXHIBIT V-2—ACCOUNT NO. 44—COST OF PISTONS SOLD

1919			
November	30	Finished Pistons, 137 Sold in Nov.	422.77
December	31	Finished Pistons Sold (184) Dec.	300.48
1920			
March	31	Pistons returned from Little Rock	88.20
March	31	Pistons returned from Fkln. Ross M. Co., St. Louis	18.96
March	31	Pistons returned Billings, Mont.	2.51
April	1	Pistons returned	867.42
April	20	" "	42.66
May	31	2 Pistons returned F. M. Car Co., Chi.	10.52
May	31	1 Piston returned Deschler, Oak Park, Ill.	5.26
May	31	3 Pistons returned F. M. Car Co., Chicago	15.78

DEFENDANTS' EXHIBIT V-4—ENTRY BOOK CONSISTING OF SALES, COSTS, FACTORY EXPENSE, ET CETERA

Note on Flyleaf—"Started new system Piston Manufacture August 17, 1920—Had men come to office for a short meeting—so as to give them better understanding of our method"

1919			
December	26	Sales Pistons Franklin Sales Co., Streator, Ill.	$ 44.10
December	26	Sales Pistons	24.99
		Sales Pistons, Franklin Motor Car Company, Chicago	44.10
December	31	Sales Pistons, Dixie Motor Sales Co.	44.10
December	31	E. C. Long, Chas. Bartlett, For Pistons	9.80
1920			
January	23	Advertising, E. C. Long, Giving Mr. Long Cost price on Pistons used in Mr. Chas. Bartlett's car	52.56
January	22	E. C. Long, Finished Goods ...	53.13

DEFENDANTS' EXHIBIT.

Bill of Complaint in Case No. 3510 in the U. S. District Court for the Northern District of Ohio, The Cleveland Trust Company and Chrysler Corporation vs. The Simmons Mfg. Co. and Sterling Products Corp.

(Filed in District Court.)

IN THE UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF OHIO
EASTERN DIVISION

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Plaintiffs,
vs.
THE SIMMONS MANUFACTURING COMPANY,
STERLING PRODUCTS CORPORATION,
Defendants.

(In Equity No. 3510.)

Spillman-Mooers	1,092,870
Mooers	1,402,309
Franquist	1,153,902
Schmiedeknecht	1,256,265
Howdeshell	16,273
Maynard	1,655,968
Jardine	1,763,523
Gulick	1,815,773

AMENDED BILL OF COMPLAINT

Now come the Plaintiffs and, pursuant to the Order of this Court hereto annexed, file this amended Bill of Complaint. Plaintiffs allege:

1. That Plaintiff, The Cleveland Trust Company, is a corporation organized and existing under the laws of the State of Ohio, having its principal place of business at Cleveland, State of Ohio.

That Plaintiff, Chrysler Corporation, is a corporation organized and existing under the laws of the State of Delaware, having its principal place of business at Highland Park, State of Michigan.

2.

That Defendant, The Simmons Manufacturing Company of Cleveland, Ohio, is a corporation organized and existing under the laws of the State of Ohio and is a citizen and inhabitant thereof, having a regular and established place of business at 3506 Perkins Avenue in the City of Cleveland, County of Cuyahoga and State of Ohio.

That Defendant, Sterling Products Corporation of St. Louis, Missouri, is a corporation duly organized and existing under the laws of the State of Missouri and has a regular and established place of business at 2914 North Market Street in the City of St. Louis, County of St. Louis, and State of Missouri.

3.

This suit is brought under the patent laws of the United States, and seeks injunctive and other relief against the defendants and each of them for infringements and contributory infringements committed by each and both defendants within this Judicial District and elsewhere within the United States.

4.

That heretofore and prior to the 18th day of July, 1913, Edward O. Spillman and Louis P. Mooers, citizens of the United States, then residing at North Tonawanda in the County of Niagara and State of New York, were the original, first and joint inventors of certain new and useful improvements in Pistons for Explosion Engines or Motors, fully described in Letters Patent of the United States, No. 1,092,870 hereinafter mentioned, which invention or improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country, prior to their invention thereof, or more than two years prior to their application for said Letters Patent, and has not been in public use or on sale in this country for more than two years prior to said application, and had not been abandoned to the public, and had not been patented or caused to be patented by them or their legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of their application for Letters Patent of the United States therefor; that the said Edward O. Spillman and Louis P. Mooers made due application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress, for Letters Patent of the United States for said invention or improvement, and having in all respects complied with the conditions and requirements of said Acts of Congress, on the 14th day of April, 1914, Letters Patent of the United States No. 1,092,870, signed, sealed and executed in due form of law, for the said invention or improvement were is-

sued and delivered unto said Edward O. Spillman and Louis P. Mooers, whereby there was secured unto them, their successors and assigns for the term of seventeen years from the said 14th day of April, 1914, the sole and exclusive right to make, use and sell to others to be used, through the United States and the territories thereof, the aforesaid invention or improvement, all as by said Letters Patent, or a duly authenticated copy thereof in Court to be produced and shown unto Your Honors, will more fully and at large appear.

5.

That subsequent to the granting of the aforesaid Letters Patent, namely, on or about the 16th day of June, 1916, by an instrument in writing, one George B. Pitts acquired from said Edward O. Spillman and The Herschel Spillman Company, a corporation of the State of New York, the undivided one-half of the entire right and interest in, to and under said Letters Patent of the United States No. 1,092,870, said assignment having been duly recorded on the 5th day of September, 1916, in Liber R-101, page 1 of the Transfers of Patents; that thereafter and on or about the 3rd day of July, 1919, the said George B. Pitts by an instrument in writing that was duly recorded in the United States Patent Office on the 28th day of July, 1919 in Liber Q-107, page 336 of the Transfers of Patents, assigned said undivided one-half of the entire right, title and interest in, to and under said Letters Patent No. 1,092,870 to your Orator, The Cleveland Trust Company; and that the said Louis P. Mooers on the 10th day of July, 1919, by an instrument in writing that was duly recorded in the United States Patent Office on the 28th day of July, 1919, in Liber Q-107, page 339 of the Transfers of Patents, assigned the remaining undivided one-half of the entire right, title and interest in, to and under said Letters Patent No. 1,092,870 to your Orator, The Cleveland Trust Company, whereby your Orator became vested with and holds the entire right, title and interest in, to and under said Letters Patent No. 1,092,870, as will more fully and at large appear upon production in Court of the assignments aforesaid.

6.

That heretofore and prior to the 2nd day of June, 1917, Louis P. Mooers, a citizen of the United States, then residing at Cincinnati, Hamilton County, State of Ohio, was the original, first and true inventor of certain new and useful improvements in Pistons for Internal Combustion Motors, fully described in Letters Patent of the United States No. 1,402,309, hereinafter mentioned, which invention or improvement was not known or used by others in this country or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his application for said Letters Patent, had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States therefor; that the said Louis P. Mooers made due application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress, for Letters Patent of the United States for said invention and improvement.

7.

That by an instrument in writing duly executed and delivered by said Louis P. Mooers and duly recorded in the United States Patent Office in Liber P. 103, page 133 of the Transfers of Patents, said Louis P. Mooers assigned an undivided half of the entire right, title and interest in, and to said invention and improvement and in and to said application for Letters Patent to George B. Pitts of Cleveland, Ohio and authorized and requested the Commissioner of Patents to issue the Letters Patent upon said application and for said invention and improvement to said George B. Pitts and Louis P. Mooers; and by said instruments in writing specified in Article 3 of this Bill as recorded in Liber Q-107, pages 336 and 339 of the Transfers of Patents, said George B. Pitts and Louis P. Mooers respectively each assigned his undivided one-half of the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,402,309 to your Orator, The Cleveland Trust Company, and authorized and requested the Commissioner

of Patents to issue the Letters Patent upon said application and for said invention and improvement to said The Cleveland Trust Company; whereby your Orator became vested with and holds the entire right, title and interest in, to and under said Letters Patent No. 1,402,309, as will more fully and at large appear upon production in Court of the said Letters Patent and the assignments aforesaid.

8.

That heretofore and prior to the 1st day of August, 1914, Gustave E. Franquist deceased, then a citizen of the United States residing in the City of New Brunswick, County of Middlesex and State of New Jersey, was the original, first and sole inventor of certain new and useful improvements in Pistons, fully described in Letters Patent of the United States No. 1,153,902, which invention or improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country prior to his invention thereof for more than two years prior to his application for Letters Patent, and had not been in public use or on sale in this country for more than two years prior to said application, and had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States therefor; that said Gustave E. Franquist made such application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress for Letters Patent of the United States for said invention or improvement and, having in all respects complied with the conditions and requirements of said Acts of Congress, on or about the 21st day of September, 1915, Letters Patent of the United States No. 1,153,902, signed, sealed and executed in due form of law for the said invention or improvement, were issued and delivered unto said Gustave E. Franquist, whereby there was secured to him, his successors and assigns, for the term of seventeen years from the said 21st day of September, 1915, the sole and exclusive right to make, use and sell to others to be used throughout the United States and the territories thereof, pistons embodying the aforesaid invention or improvements, all by said Letters Patent or

a duly authenticated copy thereof in Court to be produced and shown unto Your Honors, as will more fully and at large appear.

9.

That subsequent to the granting of the aforesaid Letters Patent, namely on or about the 16th day of May, 1924, by an instrument in writing that was duly recorded in the United States Patent Office on or about the 9th day of June, 1924, in Liber 121 of the Transfers of Patents, page 199, said Gustave E. Franquist assigned the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,153,902 to your Orator, The Cleveland Trust Company; whereby your Orator became vested with and now owns and holds the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,153,902, as will more fully and at large appear upon production in Court of the assignments aforesaid.

10.

That heretofore and prior to the 22nd day of May, 1920, Roland M. Howdeshell, a citizen of the United States then residing in the City of St. Louis, County of St. Louis and State of Missouri, was the original, first and sole inventor of certain new and useful improvements in Pistons for Engine Cylinders, as fully described in Letters Patent of the United States No. 1,473,233, which invention or improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country prior to his invention thereof, or more than two years prior to his application for Letters Patent; had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States therefor; that said Roland M. Howdeshell made due application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress for Letters Patent of the United States for said invention or improvement.

11.

That by an instrument in writing duly signed, sealed and delivered on or about the 20th day of May, 1920, and duly recorded in the United States Patent Office on or about the 22nd day of May, 1920, in Liber H-110, page 170 of the Transfers of Patents, the said Roland M. Howdeshell did sell, assign and transfer to H. & H. Machine Company, a corporation of Missouri having its principal place of business at St. Louis, Missouri, the entire right, title and interest in and to the said invention and application for Letters Patent and Letters Patent to issue thereon, and said Roland M. Howdeshell, having in all respects duly complied with the conditions and requirements of said Acts of Congress, and after due examination of the aforesaid application, the Commissioner of Patents did, on or about the 6th day of November, 1923, grant and deliver said Letters Patent of the United States No. 1,473,233 to said H. & H. Machine Company, in the name of the United States of America; whereby there was granted to said H. & H. Machine Company, its successors and assigns, the exclusive right to make use of said invention throughout the United States and the territories thereof, for the term of seventeen years from the said 6th day of November, 1923, as will more fully and at large appear by the production in this Court of a duly authenticated copy of said Letters Patent.

12.

That subsequent to the granting of the aforesaid Letters Patent No. 1,473,233, said H. & H. Machine Company, by an instrument in writing dated the 16th day of March, 1925 and duly recorded in the United States Patent Office on or about the 13th day of April, 1925 in Liber W-123, pages 440 and 442 of the Transfers of Patents, said H. & H. Machine Company assigned the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,473,233 to The Cleveland Trust Company, plaintiff, whereby plaintiff became vested with and now holds the entire right, title and interest in, to and under said Letters Patent No. 1,473,233, as will more fully and at large appear upon production in Court of the assignments aforesaid.

13.

That on or about the 20th day of August, 1925, said Roland M. Howdeshell and said The Cleveland Trust

Company, verily believing that the aforesaid Letters Patent of the United States No. 1,473,233 were inoperative for the reason that the specification thereof was defective, and that such defect consisted particularly in the failure of the patent to claim broadly the novel features of the invention therein disclosed, said Letters Patent were surrendered to the United States Patent Office and an application for re-issue of the aforesaid Letters Patent was made by said Roland M. Howdeshell and his assignee, The Cleveland Trust Company, plaintiff.

14.

That after due examination of said application for re-issue of said Letters Patent, the Commissioner of Patents did, on or about the 23rd day of February, 1926, grant and deliver to plaintiff, The Cleveland Trust Company, as assignee of said H. & H. Machine Company, in the name of the United States of America, United States re-issue Letters Patent No. Re-16,273; whereby there was granted to plaintiff, its successors and assigns, the exclusive right, for the term of seventeen years from said 23rd day of February, 1926, to make, use and sell pistons embodying said inventions throughout the United States and the territories thereof, as will more fully and at large appear by production here in this Court of the original of said Re-issue Letters Patent Re-16,273.

15.

That heretofore, and prior to the third day of January, 1921, Howard E. Maynard, then residing at Detroit, in the County of Wayne and State of Michigan, was the original, first and true inventor of certain new and useful improvements in Pistons fully described in Letters Patent of the United States No. 1,655,968 hereinafter mentioned, which invention or improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country before his said invention or discovery thereof, or more than two years prior to his application for Letters Patent therefor, and had not been in public use or on sale in this country for more than two years prior to his application for Letters Patent therefor; and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of the application for Letters Patent thereon in this country.

16.

That the said Howard E. Maynard, being as aforesaid, the inventor of the said improvement, made application to the Commissioner of Patents of the United States for Letters Patent in accordance with the then existing Acts of Congress, and, having in all respects complied with the conditions and requirements of said Acts of Congress, on the tenth day of January, 1928 Letters Patent of the United States numbered 1,655,968, signed, sealed and executed in due form of law, for the said invention or improvement, were issued to said Chrysler Corporation, a corporation of Delaware, at Highland Park, Michigan, plaintiff, and Aluminum Company of America, a corporation of Pennsylvania, at Pittsburgh, Pa., as assignees each of one-half of the entire right, title and interest in and to said Letters Patent, whereby there was secured to Chrysler Corporation and Aluminum Company of America for the term of seventeen years from the tenth day of January, 1928, the sole and exclusive right to make, use and sell to others to be used throughout the United States and the territories thereof, the aforesaid invention or improvement, all as by said Letters Patent, or a duly authenticated copy thereof here in Court to be produced and shown unto Your Honors, as will more fully and at large appear.

17.

That prior to the filing of this Bill of Complaint, said Aluminum Company of America, by an instrument in writing dated February 23, 1928 and recorded in the Transfers of Patents in the United States Patent Office as of May 12, 1930 in Liber Z-143, page 283, assigned its undivided one-half interest in the entire right, title and interest in and to said Letters Patent No. 1,655,968 to The Cleveland Trust Company, plaintiff herein, together with the right to sue for and recover damages for past infringements of said Letters Patent, whereby your plaintiff, The Cleveland Trust Company, became vested with and now holds an undivided one-half interest in the entire right, title and interest in, to, and under said Letters Patent No. 1,655,968, as will more fully and at large appear upon production in Court of the assignments aforesaid.

18.

That the plaintiff, Chrysler Corporation, is a non-resident and resides without the jurisdiction of this Court and therefore cannot be served with process and made a co-defendant in this cause, and that plaintiff, The Cleveland Trust Company, has advised Chrysler Corporation of the imminent pendency of this case and of the obligation of Chrysler Corporation to join voluntarily in the bringing of this suit, but that Chrysler Corporation has refused or declined to so voluntarily join and that the plaintiff, The Cleveland Trust Company, is without remedy on the Maynard patent unless Chrysler Corporation is joined as a co-plaintiff in this cause, and therefore to prevent a failure of justice and to enable The Cleveland Trust Company to protect its interests herein, the Chrysler Corporation is made a plaintiff herein without its consent.

19.

That heretofore and prior to the 11th day of March, 1920, Frank Jardine, a citizen of the United States, then residing at Cleveland, in the County of Cuyahoga and State of Ohio, was the original, first and true inventor of certain new and useful improvements in Pistons, fully described in Letters Patent of the United States No. 1,763,523, hereinafter mentioned, which invention or improvement was not known or used by others in this country or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his application for said Letters Patent; had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States therefor; that the said Frank Jardine made due application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress, for Letters Patent of the United States for said invention and improvement, and having in all respects complied with the conditions and requirements of said Acts of Congress, and having, by mesne assignments, as will more fully and at large appear upon production in Court of said assign-

ments, assigned his entire right, title and interest in and to said Letters Patent No. 1,763,523 to The Cleveland Trust Company, as a Trustee, and having authorized and requested the Commissioner of Patents to issue the Letters Patents upon said application and for said invention and improvements to said The Cleveland Trust Company, on or about the 10th day of June, 1930, Letters Patent of the United States No. 1,763,523, signed, sealed and executed in due form of law, for the said invention or improvement, were issued and delivered to plaintiff, The Cleveland Trust Company, whereby there was secured to it, its successors and assigns, for the term of seventeen years from the said 10th day of June, 1930, the sole and exclusive right to make, use, and sell to others to be used, throughout the United States and the territories thereof, the aforesaid invention or improvement, all as by said Letters Patent or a duly authenticated copy thereof in Court to be produced and shown unto Your Honors, will more fully and at large appear.

20.

That heretofore and prior to the 14th day of July, 1917, Victor E. Schmiedeknecht, a citizen of the United States then residing at Louisville in the County of Jefferson and State of Kentucky, was the first and true inventor of certain new and useful improvements in Pistons, fully described in Letters Patent of the United States No. 1,256,265, hereinafter mentioned, which invention and improvement was not known or used by others in this country, or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his application for said Letters Patent; had not been in public use or on sale in this country for more than two years prior to said application; had not been abandoned to the public, and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of his application for Letters Patent of the United States therefor; that the said Victor E. Schmiedeknecht made due application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress, for Letters Patent of the United States for said invention and improvement, and having in all respects com-

plied with the conditions and requirements of said Acts of Congress, on the 12th day of February, 1918, Letters Patent of the United States No. 1,256,265, signed, sealed and executed in due form of law for the said invention or improvement, were issued and delivered unto said Victor E. Schmiedeknecht, his successors and assigns, for the term of seventeen years from said 12th day of February, 1918, the sole and exclusive right to make, use and sell to others to be used, throughout the United States and the territories thereof, the aforesaid invention or improvement, all as by said Letters Patent or a duly authenticated copy thereof in Court to be produced and shown to Your Honors will more fully and at large appear.

21.

That subsequent to the granting of the aforesaid Letters Patent No. 1,256,265, by an instrument in writing that was duly recorded in the United States Patent Office on or about the 16th day of August, 1927 in Liber F-131, page 79 of the Transfers of Patents, said Victor E. Schmiedeknecht assigned the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,256,265, together with the right to sue for, collect, and retain damages and profits for past infringement under said Letters Patent to one Frank Kent of New York City; and, whereas this assignment was further amplified by further warranty and guarantee that was also recorded in the United States Patent Office on or about the 16th day of August, 1927 in Liber P-131, page 81 of the Transfers of Patents; whereby said Frank Kent, his successors and assigns, became vested with the entire right, title and interest in, to and under said Letters Patent of the United States No. 1,256,265, together with the right to sue for, collect, and retain damages and profits for past infringements of said Letters Patent.

22.

That by an instrument in writing dated October 12, 1927 and duly recorded in the United States Patent Office in the Transfers of Patents, said Frank Kent assigned the entire right, title and interest in, to and under said Letters Patent of the United States, together with the right to sue, collect, and retain damages and profits for past infringement, to Bohn Aluminum & Brass Corporation of Detroit, Michigan, its successors and assigns.

23.

That said Bohn Aluminum & Brass Corporation, by an instrument in writing dated on or about August 31st, 1927, and recorded in the United States Patent Office in Liber C-133, page 618 of the Transfers of Patents, assigned to Your Orator, The Cleveland Trust Company, its successors and assigns, the entire right, title and interest in, to and under said Letters Patent, together with the right to sue for, collect and retain damages and profits for past infringements of said Letters Patent; whereby plaintiff, The Cleveland Trust Company became vested with and now holds the entire right, title and interest in, to and under the aforesaid Letters Patent No. 1,256,265, and the right to sue for, collect and retain damages and profits for past infringement of said Letters Patent, as will more fully and at large appear upon production in this Court of the assignments aforesaid or duly authenticated copies thereof.

24.

That heretofore and prior to the 30th day of November, 1917, Edward J. Gulick, a citizen of the United States then residing in Mishawaka, County of St. Joseph, and State of Indiana was the original, first and true inventor of certain new and useful improvements in Pistons, fully described in application for Letters Patent of the United States, Serial No. 204,661, which invention was not known or used by others in this country or patented or described in any printed publication in this or any foreign country, prior to his invention thereof, or more than two years prior to his said application for Letters Patent therefor; that said invention had not been in public use or on sale in this country for more than two years prior to said application for Letters Patent, had not been abandoned to the public and had not been patented or caused to be patented by him or his legal representatives or assigns in any foreign country upon an application filed more than twelve months prior to the filing of said application for Letters Patent of the United States; that on or about November 30, 1917, said Edward J. Gulick made due application to the Commissioner of Patents of the United States in accordance with the then existing Acts of Congress, for Letters Patent of the United States for said invention or improvements and, having in all respects complied with the conditions and requirements of said Acts of Congress, on the 21st

day of July, 1931, Letters Patent of the United States No. 1,815,773 were signed, sealed and executed in due form of law for the said invention, and were issued and delivered unto Plaintiff, The Cleveland Trust Company, its successors and assigns, as assignee of the entire right, title and interest of said Edward J. Gulick, for the term of seventeen years from said 21st day of July, 1931, thereby granting to it the sole and exclusive right to make, use and sell to others to be used, throughout the United States, its territories and dependencies, the aforesaid invention or improvements, all as by said Letters Patent or a duly authenticated copy thereof in Court to be produced and shown to Your Honor, as will more fully and at large appear.

25.

That prior to the grant of aforesaid Letters Patent No. 1,815,773, said Edward J. Gulick assigned to the Packard Motor Car Company of Detroit, Michigan, his entire right, title and interest in and to the invention set forth and described in the aforesaid application for Letters Patent Serial No. 204,661 by an instrument in writing dated Nov. 23, 1917 that was duly recorded in the United States Patent Office on or about the 30th day of November, 1917, in Liber J-103, page 468 of the Transfers of Patents; whereby said Packard Motor Car Company of Detroit, Michigan, its successors and assigns became vested with the entire right, title and interest in and to the aforesaid invention and in and to said application for Letters Patent Serial No. 204,661 and in and to any Letters Patent issuing pursuant thereto.

26.

That, on or about September 11, 1922 and prior to the grant of aforesaid Letters Patent No. 1,815,773, the Packard Motor Car Company of Detroit, Michigan, assigned to The Cleveland Trust Company of Cleveland, Ohio, its entire right, title and interest in and to the invention set forth and described in the aforesaid application for Letters Patent Serial No. 204,661 and in and to said application for Letters Patent by an instrument in writing dated September 11, 1922 that was duly recorded in the United States Patent Office on or about the 13th day of September, 1922, in Liber S-116, page 485 of the Transfers of Patents, whereby said The Cleveland Trust Company of Cleveland, Ohio, its successors

and assigns became vested with, has continuously held and now owns the entire right, title and interest in and to said invention and in and to said application for Letters Patent Serial No. 204,661 and in and to said Letters Patent of the United States No. 1,815,773 that issued pursuant thereto.

27.

That the validity of each of the aforesaid Letters Patent has been recognized and acquiesced in by the public generally since the date of issue of each of said patents, except for those defendants and others encouraged by them. At various times said patents have been especially recognized and acquiesced in by parties who have discontinued infringement thereof and who have made due amends to plaintiff. Others have taken licenses under said patents. Substantial and material royalties have been paid to the plaintiff under said patents. The licensees under said patents have manufactured and sold the pistons covered by said patents in great numbers. These pistons have gone into extensive and successful use. Licensees under said patents have built plants and established organizations for the manufacture and sale of such pistons on the strength of and by reason of their confidence in the patents here in suit.

28.

That plaintiff has duly notified each and both of these defendants of their infringement of each of the aforesaid Letters Patent and has requested them and each of them to desist, but defendants and each of them have continued their infringements in defiance of said notices.

29.

These defendants, The Simmons Manufacturing Company and Sterling Products Corporation, jointly and severally, subsequent to the grant of said Letters Patent and prior to the filing of this Bill of Complaint and within six years hereof, with full knowledge of each of said Letters Patent and without the consent of plaintiff, The Cleveland Trust Company, but in violation of its rights, and after due notice, has within the Judicial District of this Court and elsewhere within the United States, infringed each of the aforesaid Letters Patent

and contributed to the infringement thereof by making and/or causing to be made, by using and/or causing to be used, and selling and/or causing to be sold in this Judicial District and elsewhere within the United States, Pistons for Internal Combustion Engines embodying jointly and severally the inventions of said Letters Patent and in infringement thereof.

That in so infringing, defendants have realized and received great gains and profits which should, and otherwise would, have been received by plaintiffs, each and both of them, and defendants, and each and both of them, have correspondingly inflicted on plaintiffs great loss and damage, but to what extent plaintiffs cannot now set forth and therefore pray discovery with respect thereto; that plaintiffs fear and have reason to fear that defendants will continue their aforesaid infringing acts to an even greater extent unless enjoined by this Honorable Court; and defendants, and each of them, have and will thereby induce others to venture to infringe the said Letters Patent aforesaid, to the irreparable injury of plaintiffs.

30.

Because of these premises, plaintiffs are without adequate or sufficient remedy at law and therefore bring this suit in equity.

WHEREFORE, the plaintiffs pray:

First. That a writ of subpoena ad respondum may issue out of and under the seal of this Court requiring each and both of said defendants, The Simmons Manufacturing Company and Sterling Products Corporation, to appear and make answer to this Bill of Complaint, but not under oath, answer under oath being hereby expressly waived, to the best and utmost of their knowledge, information and belief and to do and perform such things as to this Court may seem meet and just;

Second. That this Court may grant an injunction, perpetual as well as temporary, enjoining each and both of said defendants, The Simmons Manufacturing Company and Sterling Products Corporation, as well as each of the directors, officers, associates, successors, agents, attorneys and employees, and every person acting for or on the behalf of each and/or both of said defendants, from further infringing or contributing to the infringement of any and/or each of said Letters Patent;

Third. That said defendants, The Simmons Manufacturing Company and Sterling Products Corporation, and each and both of them, may be required to account before a Master in the usual manner of accountings for the gains, profits and advantages due to and arising out of their aforesaid infringements and contributory infringements herein complained about, as well as the damages sustained by plaintiffs, by reason of said infringements;

Fourth. That said defendants, The Simmons Manufacturing Company and Sterling Products Corporation, each and both of them, be required to pay over to plaintiffs, the gains and profits so accounted for and also the damages sustained by plaintiffs as the result of said infringements and contributory infringements;

Fifth. That the defendants, each and both of them, be decreed to pay the costs, charges and disbursements of this suit;

Sixth. That the plaintiffs may have such other and further relief as the equity of the case may require, and as to this Honorable Court may seem just and proper.

THE CLEVELAND TRUST COMPANY,
By: .....,
Vice-President.

CHRYSLER CORPORATION,
By: .....,
Vice-President, The Cleveland Trust Company.

.....,
Solicitor for Plaintiffs.

AFFIDAVIT

STATE OF OHIO,
COUNTY OF CUYAHOGA, ss.

On this 1st day of August, 1931, before the undersigned, a Notary Public within and for the County and State aforesaid, personally appeared R. A. Malm and made oath that he is the Vice President of The Cleveland Trust Company, the above named complainant, that he has read the foregoing Bill of Complaint, and knows the contents thereof, and that the same is true, except as to those matters stated on information and belief, and as to those matters he believes it to be true.

D. F. KING,
Notary Public.

DEFENDANTS' EXHIBIT 5-J.

Letter, dated Oct. 17, 1932 from Anna Landon Duke to J. H. Bruninga.

(Filed January 27, 1934.)

Iowa City, Iowa, Oct. 17, 1932

Mr. J. H. Bruninga,
St. Louis, Mo.

Dear Sir:

I have carefully gone over the sheets of record which you sent me, and have placed my initials "A.L.D." on the backs of the ones that I recognize as work done by me at the M. K. Weems place.

Trusting that this will give you the needed help, I am,

Yours truly,

(Mrs.) Anna Landon Duke.

DEFENDANTS' EXHIBIT 5-K$_1$.

Letter, dated May 4, 1915, from Walter L. Schoengarth to Louis Bagger & Co.

(Filed January 27, 1934.)

Rec'd May 10 1915
Am't 5
Ack'ld May 10
Ans'd May 13 1915

Ironwood, Mich.,
May 4, 1915.

Louis Bagger & Co., Counsellors at Law,
Washington, D. C.

Gentlemen:

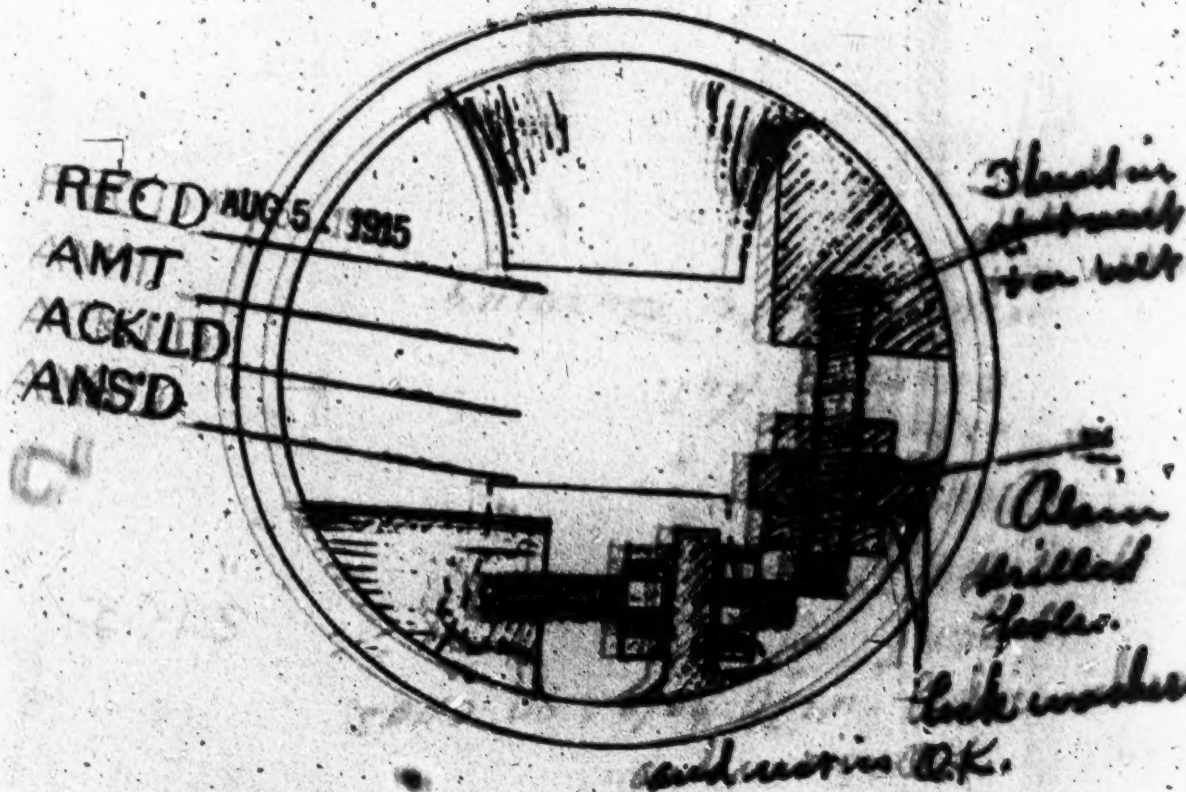
Enclosed find $5.00 five dollars for first examination on invention which I call The Adjustable Piston. I am sending you model by express. Hoping you will all O.K. I remain

Yours truly,

WALTER L. SCHOENGARTH.

202 Fredrick St.

P. S. You will also find sketch and write-up on same.



DEFENDANTS' EXHIBIT 5-K,(1).
Tracing of Schwagerth Piston.
(Filed January 27, 1934.)

DEFENDANTS' EXHIBIT 5-K,(2).
Tracing of Schoengarth Piston.
(Filed January 27, 1934.)

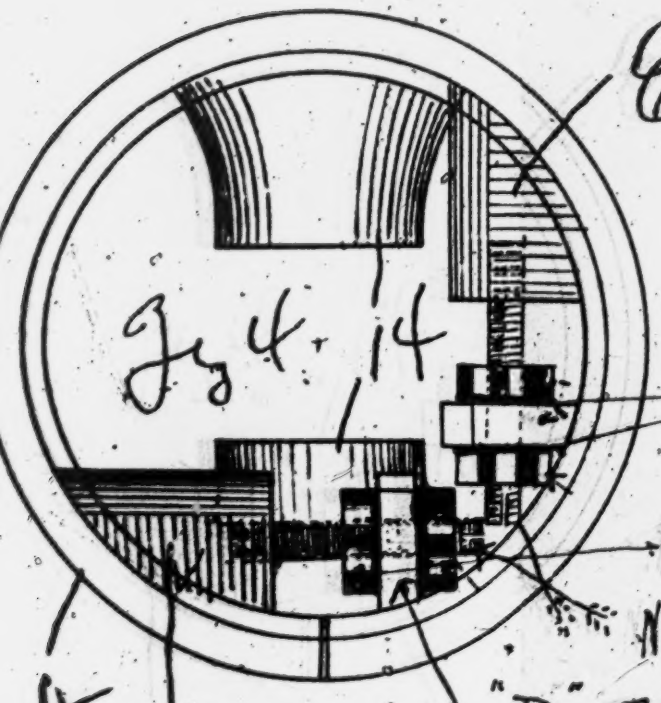


Fig 4. 14

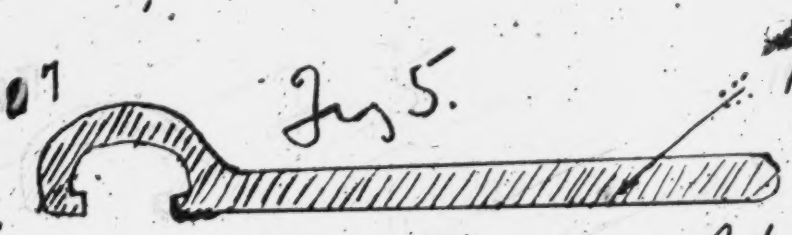
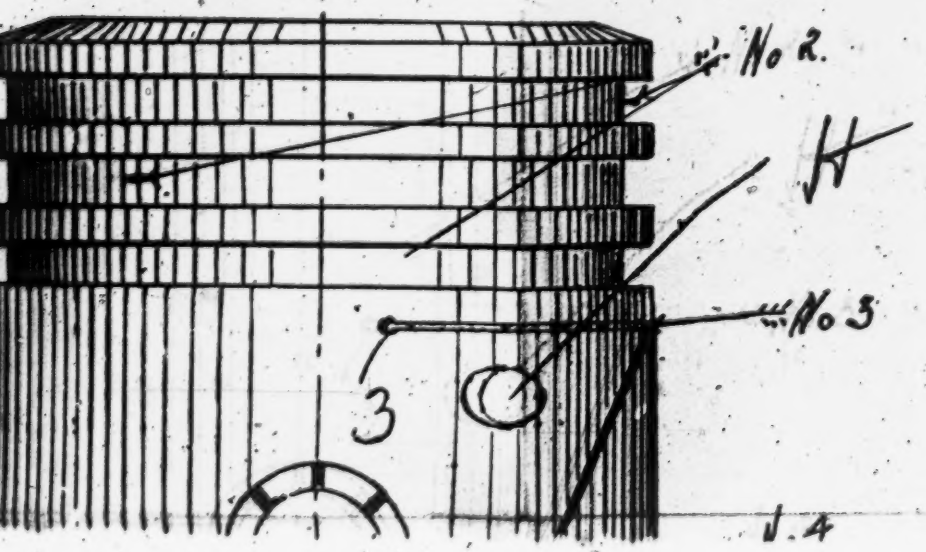
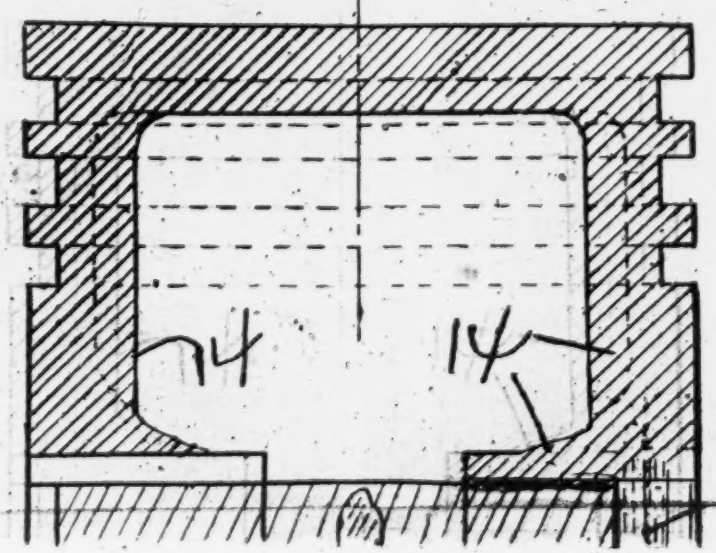


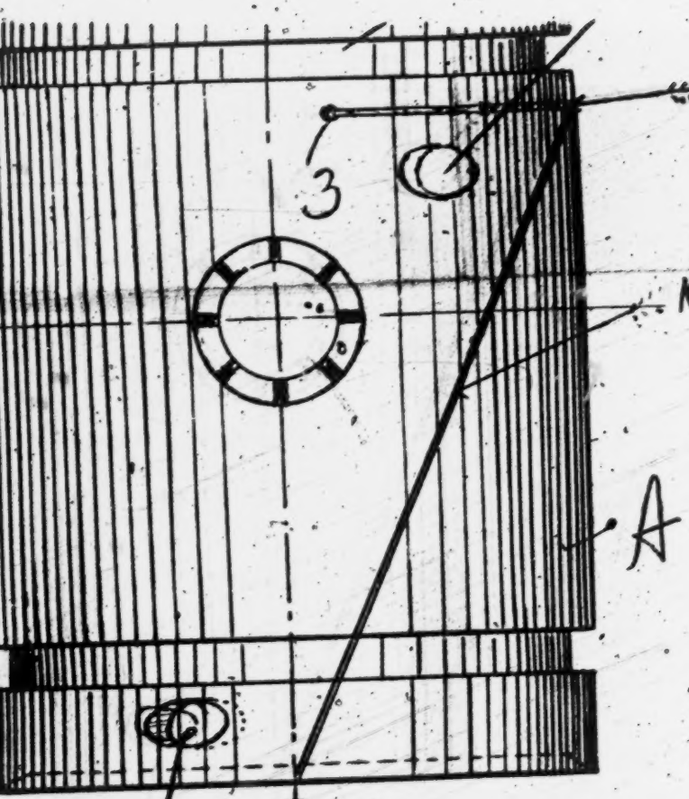
Fig 5.

"C" Adjustment

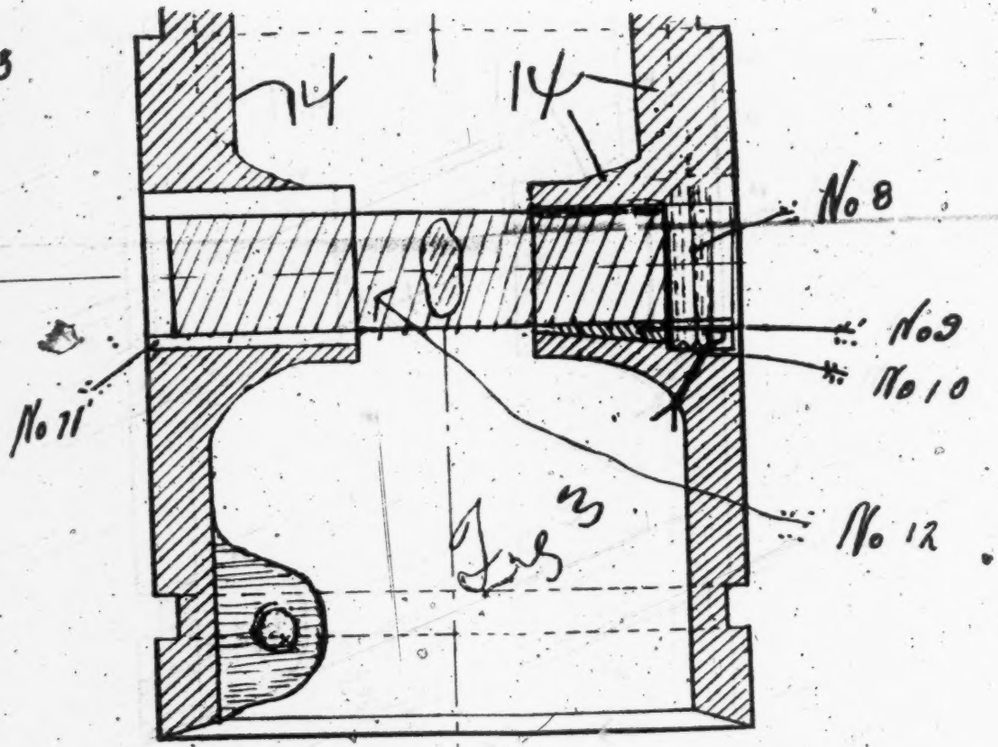
No 1 Oi
No 2 Rin
No 3 Upei
No 4 Adju
No 5 Adju
No 6 Adju
No 7 Lock
No 8 Take
No 9 Tune
No 10 Colle
No 11 Plain Bushin
No 14 Cross Head F
No 13 Convenient Wrenc







FRONT VIEW



CROSS SECTION THRU A-B

RECD MAY 10 1915
AMT
ACK'LD may 10
ANS'D

Walter L. Schoengarth.

Iron Wood.

Michigan.

May 9th 1915.

Front
Positi

No 1 Piston

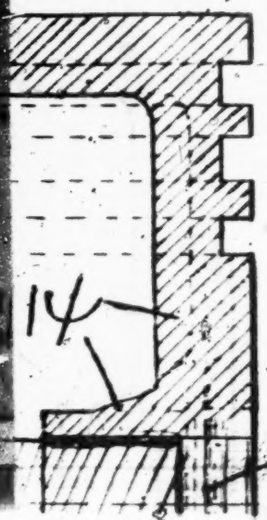
No 2 Ring pins.
No. 3 Upper Slot - with holes on ends.
No. 4 Adjustment Slot
No 5 Adjustment Studs.
No 6 Adjustment Nuts
No 7 Lock Washers
No 8 Take up Bushing Nut.
No 9 Take up or Adjustable Bushing
No 10 Coller pin

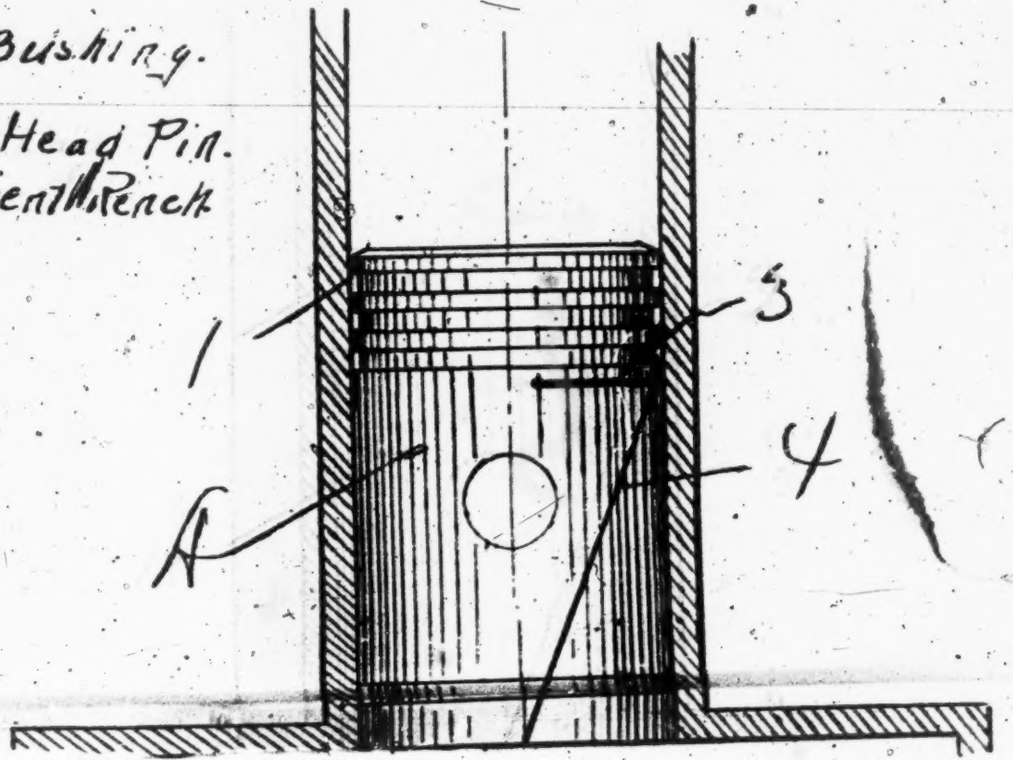
5K2

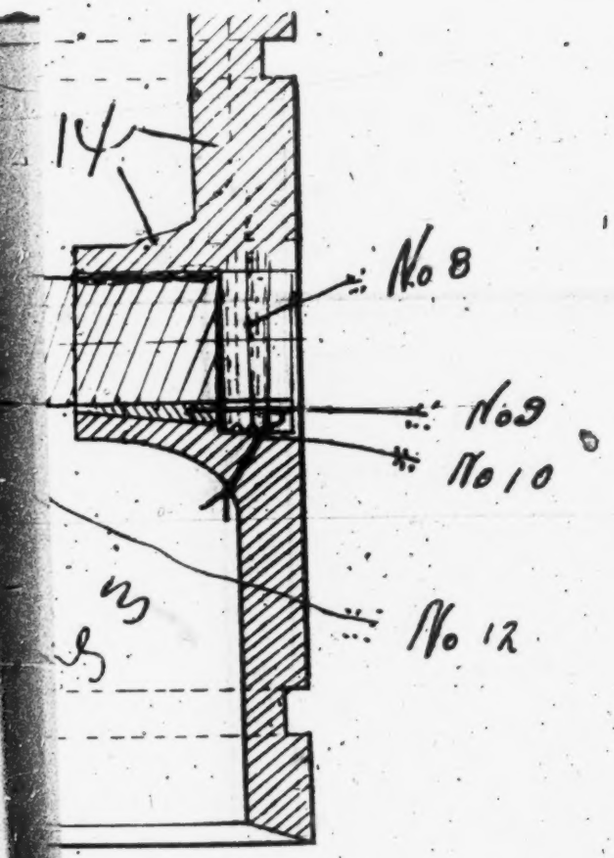
No. 13

Adjustment Nuts

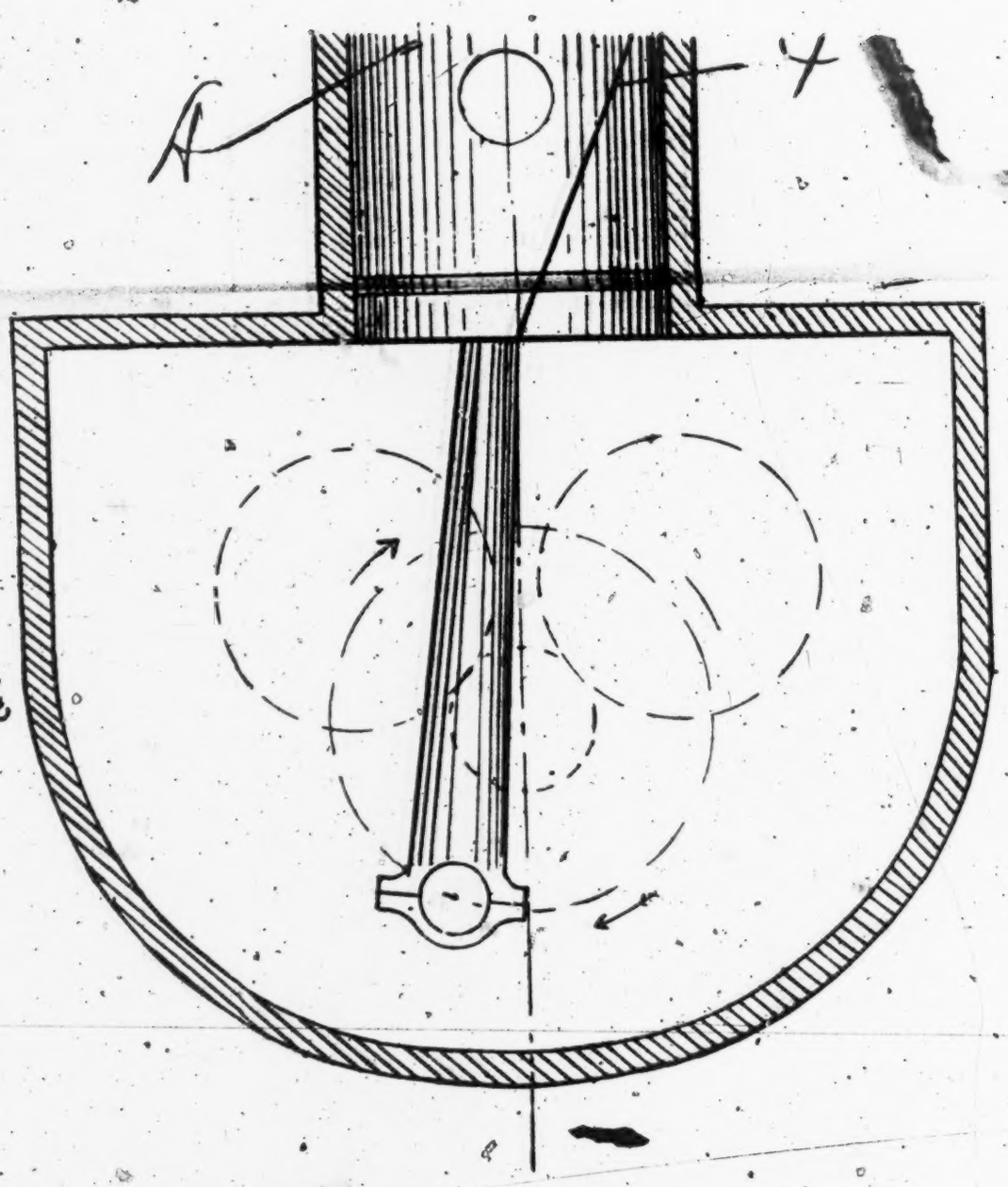
No 11 Plain Bushing.
No 12 Cross Head Pin.
No 13 Convenient Wrench







ION THRU A-B



REC'D MAY 10 1915
AMT
ACK'LD may 10
ANS'D

°Front View of Motor Showing Position of Piston.

AN.

DEFENDANTS' EXHIBIT 5-K$_3$.

Three Page Description by Schoengarth of "The Adjustable Gas Engine Piston."

(Filed January 27, 1934.)

Rec'd May 10 1915.
Ack'ld May 10

THE ADJUSTABLE GAS ENGINE PISTON.

This piston is made for the purpose of preventing what is called piston knock and flutter. It can be adjusted according to wear and last the life time of the motor being quiet without knock or flutter. This prevents reboring and new pistons.

It also can be ground in according to the repairman's or builder's desire; which cuts away all rough surfaces and then be adjusted to a more perfect fit.

As experience has taught, a lap joint or leak proof ring with a good fit in grooves worn to fit cylinder snugly will prevent leakage and give better compression than new rings.

This piston is to be fitted with either such rings.

The cross head bushing at No. 9 are also adjustable by taking out bushing and cutting slot, placing in a few liners, the bushing may be lined up to fit cross head pin then drawn up with take-up nut No. 8 which follows bushing. This nut is securely held in place with cotter pin No. 10.

The bushing seat is reinforced to top of piston as shown in drawing and model A. B.

This piston can also be made with plain bushings if desired.

Small pins are inserted at upper ring grooves to prevent rings from shifting.

Two small holes are drilled at ends of slot No. 3.

Slot 4 is cut diagonally for two purposes first to prevent scar 2nd for the convenience of getting at upper & lower piston adjustment.

The piston adjustment is taken up in two places 1st the upper adjustment shown at "C", 2nd lower adjustment shown at "D".

This adjustment is composed of a stud with jam nut and lock washers on each side of lug.

The piston is to be made of cast steel or some malleable metals.

The cross head pin bushings are to be made of bronze or brass.

The take-up nuts, studs, and jam nuts are to be made of soft steel.

The lock washers to be made of tempered steel.

The piston is to be placed in motor as shown at motor view. This being for the purpose of keeping solid side of piston on explosion wall or the side of cylinder where the explosion or cumbustion forces piston against cylinder wall when on the power stroke. Looking from the front, slot to be on the right side. See view or motor view at right of sketch.

Sig. WALTER L. SCHOENGARTH.

DEFENDANTS' EXHIBIT 5-K$_4$.

Letter, dated May 13, 1915, from Louis Bagger & Co. to Walter L. Schoengarth.

(Filed January 27, 1934.)

May 13, 1915.

Mr. Walter L. Schoengarth,
Ironwood, Mich.

Dear Sir:

In further reply to your letter of May 4th we have to inform you that we have completed the search on the Adjustable Piston, and found nothing which would, in our opinion, prevent the grant of a patent to you.

Upon receipt of your instructions to proceed and the remittance of the first installment of fees amounting to Twenty Dollars ($20.00) we will prepare the papers and send them to you for your review and execution.

Thanking you for the favor and awaiting your further commands, we remain

Yours very truly,

LOUIS BAGGER & Co.

DEFENDANTS' EXHIBIT 5-K$_5$.

Letter, dated May 22, 1915, from W. L. Schoengarth to Louis Bagger & Co.

(Filed January 27, 1934.)

Rec'd May 27 1915
Ans'd May 27 1915

Am't 20

Ironwood Mich
May 22 1915

Louis Bagger & Co., Counsellors at Law,
Washington D. C.

Gentlemen

Enclosed find $20.00 twenty dollars for preparation papers on execution.

Yours truly,

W. L. SCHOENGARTH.

P. S. When sending mail please place street no. 202 Fredrick St.

Credited

DEFENDANTS' EXHIBIT 5-K$_6$.

Letter, dated May 27, 1915, from Louis Bagger & Co. to W. L. Schoengarth.

(Filed January 27, 1934.)

May 27, 1915.

Mr. W. L. Schoengarth,
202 Fredrick St.,
Ironwood, Mich.

Dear Sir:

Your letter of the 22nd inst. at hand this A. M. with Twenty ($20) Dollars covering first installment of fees re. patent application on your improved Piston, for which please accept our thanks.

This matter will have our attention, and we shall forward complete application papers to you at an early date.

Very truly yours,

H.
credited

LOUIS BAGGER & Co.

DEFENDANTS' EXHIBIT 5-K,.

Letter dated July 29, 1914, from Walter L. Schoengarth to Louis Bagger & Co.

(Filed January 27, 1934.)

Rec'd Aug 5 1915 Am't 35
Ans'd Aug 5 1915

Ironwood Mich.
July 29, 1914

Louis Bagger & Co., Pat Att'ys.
Washington D. C.

Dear Sir,—

Enclosed find P. O. money order for $35.00 thirty five dollars for patent execution on adjustable piston. Also find rough drawing showing adjustment. You need not change reading on execution papers only show in drawing that abutment is threaded & stud also to end. The lug has a plain drilled hole. Otherwise all is O.K. Am well pleased. Hoping to hear from you soon, I remain,

Yours truly,

WALTER L. SCHOENGARTH.

DEFENDANTS' EXHIBIT 5-K$_2$.

Letter, dated Aug. 5, 1915, from Louis Bagger & Co. to Walter L. Schoengarth.

(Filed January 27, 1934.)

August 5, 1915.

Mr. Walter L. Schoengarth,
Ironwood, Mich.

Dear Sir:

Yours of the 29th ult. has just been received together with duly executed papers for applying for letters patent for improved Adjustable Gas Engine Pistons and Thirty Five Dollars ($35.00), covering balance of first Government and Attorney's fees in full thereon, also a little drawing showing the improvement, for all of which, please accept our thanks.

The drawings will now be made and the case will be filed just as soon as they are completed and will be vigorously prosecuted.

Very truly yours,

H/C

Louis Bagger & Co.

DEFENDANTS' EXHIBIT 5-K$_p$.

Certified Copy of Application Papers of the Schoengarth Patent No. 1,174,092.

(Filed January 27, 1934.)

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DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of the Petition, Specification, Oath and Drawings, as originally filed, October 1, 1915, Serial Number 53,625 in the matter of the Letters Patent of Walter L. Schoengarth, Number 1,174,092, Granted March 7, 1916, for Improvement in Adjustable Gas-Engine Pistons.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this twenty-first day of March, in the year of our Lord one thousand nine hundred and thirty-three and of the Independence of the United States of America the one hundred and fifty-seventh.

THOMAS E. ROBERTSON,

(Seal) *Commissioner of Patents.*

ATTEST:

D. E. WILSON,

Chief of Division.

PETITION

(15 Rec'd Oct .... 1915 C. U. S. Pat. Office)

To the Commissioner of Patents:

Your petitioner WALTER L. SCHOENGARTH, a citizen of the United States and a resident of Ironwood, in the County of Gogebic, and State of Michigan, whose Post-office address is:—202 Fredrick St., Ironwood, Michigan, prays that Letters Patent may be granted to him for the improvement in ADJUSTABLE GAS-ENGINE PISTONS, as set forth in the annexed specification.

And he hereby appoints Vernon E. Hodges and Watts T. Estabrook, doing business as:—Louis Bagger & Co., Barrister Bldg.,—635 F Street N. W., Washington, D. C., his attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to sign his name to the drawings, to receive the Letters Patent, and to transact all business in the United States Patent Office connected therewith.

Signed at Ironwood, in the County of Gogebic, and State of Michigan, this 27th day of July, 1915.

Sign full name: WALTER L. SCHOENGARTH.

(U. S. I. R. Documentary Stamp 25 Cents)

SPECIFICATION

To all whom it may concern:

Be it known, That I, WALTER L. SCHOENGARTH, a citizen of the United States, residing at Ironwood, in County of Gogebic, and State of Michigan, have invented certain new and useful improvements in ADJUSTABLE GAS-ENGINE PISTONS, of which the following is a specification:

53625—1

W. L. S.—Inv. 835
L. B. & Co.—Atty

My invention relates to an Adjustable Gas Engine Piston, the object being to prevent what is called a piston knock and flutter, and in my present invention provision is made for adjusting the size of the piston according to rule, so that it can be made to last the lifetime of the motor. The result is, it is quiet, and without knock or flutter, thus rendering re-boring and new pistons unnecessary, prolonging the life and usefulness of the motor, and greatly reducing the cost of repair, etc.

My improved piston can be ground according to the ideas of the repairman or builder, doing away with all rough surfaces, after which it may be adjusted to a perfect fit in the cylinder-bore.

With these objects in view, my present invention comprises a piston which is transversely and diagonally slotted on one side, with means inside for expanding the piston to fit perfectly the bore of the cylinder. It further consists in bushings for the cross-head pin, which are capable of quick and accurate adjustment to take up wear.

In the accompanying drawings:—

Figure 1 is a view of the motor in vertical section,

1. 53625

showing the position of piston;

Figure 2 is a side elevation of the piston;

Figure 3 is a sectional view on the line 3—3 of Figure 2;

Figure 4 is an end view looking into the piston; and

Figure 5 is a view of the wrench for adjusting nuts.

A, represents the piston, it being provided with the circumferential ring-grooves 1, 1, adapted to receive packing-rings, and ring-pins 2 are provided in these grooves to prevent the rings from shifting.

The piston has two slots, namely a transverse slot 3 cut nearly half-way thereacross on one side, and at each end of which a small hole 3′ is drilled, and a diagonal slot 4 extending from the point near the center of the transverse slot 3 to one end of the piston. This slot is cut diagonally for two purposes, first, to prevent scar, and second, for convenience in making the upper and lower piston adjustment. The piston adjustment is taken up in two places, namely at the upper end of the diagonal slot and also at the lower end. The adjustment is through the two screws or studs 5 and 5′ which turn in threaded orifices in the lugs C and D located at the upper and lower ends respecively of the piston, the inner ends of these screws or studs turning in the holes in the abutments E and F respectively.

Access is gained to these screws by a screw-driver inserted through the holes H and I respectively, and jamb-nuts 7 on these screws or studs have notched edges to receive the wrench 13 by which they are turned up

2. 53625

tight by the lock-washer 7 against the lugs C and D.

To expand the piston to the size required, the nuts are loosened, and the screws are turned in the lugs to get the required expansion, after which the jamb-nuts are tightened up against the lugs, and in this way the piston may be re-fitted to the bore of the cylinder at any time without the necessity of re-boring or the purchase and substitution of new pistons. In fact this adjustment may be accomplished without removing the piston from the cylinder.

The ends of the cross-head pin 12 are supported in cross-head bushings 9, 9. These are preferably made of

bronze or brass, and split longitudinally, having an external taper so that they are compressible around the ends of the cross-head pins by means of the take-up bushing nuts 8 at either end, and a cotter-pin 10 is inserted to hold the bushing 8 against turning. It is evident that a plain bushing, such as shown in 11, might be used instead of a tapering, adjustable one as described. The bushing-seats 14 are preferably reinforced at top of piston, as shown in Figure 3.

The piston is placed in the motor, as shown in Figure 1, that is to say with the solid side of the piston toward the expansion wall or the side of cylinder where the explosion or combustion takes place and forces the piston against the cylinder wall when on the power stroke, thus bringing the slots 3 and 4 on the right side of the engine.

Obviously more or less slight changes might be made in the form and arrangement of the several parts described without departing from the spirit and scope of

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my invention, and hence I do not wish to limit myself to the exact construction herein set forth, but:—

I claim:

1. An expansible piston having a transverse and longitudinal slot therethrough, and adjustable locking means located internally for expanding the piston.

2. A piston transversely and longitudinally slotted, and screws supported on one side of the longitudinal slot and engaging a member on the opposite side thereof, whereby when turned in one direction the piston is expanded, and when turned in the opposite direction it contracts by its own elasticity.

3. A piston transversely and longitudinally slotted, and screws supported on one side of the longitudinal slot and engaging a member on the opposite side thereof, whereby when turned in one direction the piston is expanded, and when turned in the opposite direction it contracts by its own elasticity, and means for locking said adjusting means.

4. A piston transversely and longitudinally slotted, and having holes therethrough on one side of the longi-

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tudinal slot, lugs and abutments located on opposite sides of the longitudinal slots and having orifices therein in alignment with the holes in the pistons, and screws extending through said orifices in the lugs and abutments, accessible through holes in the piston, for adjusting the piston.

5. A piston transversely and longitudinally slotted, and having holes therethrough on one side of the longitudinal slot, lugs and abutments located on opposite sides of the longitudinal slots and having orifices therein in alignment with the holes in the pistons, screws extending through said orifices in the lugs and abutments, accessible through holes in the piston, for adjusting the piston, and lock-nuts located on the screws on opposite sides of the lugs for locking the screw against turning to hold the piston in its adjusted position.

6. The combination with a piston, of a cross-head pin, a tapering adjustable bushing, and a take-up bushing-nut for moving the bushing endwise and contracting it around the cross-head pin.

7. The combination with a piston of a cross-head pin, a tapering adjustable bushing, and a take-up bushing-nut for moving the bushing endwise and contracting it around the cross-head pin, the bushing-nut externally screw-threaded to turn in a threaded orifice concentric with the outer end of the bushing, and means for locking the bushing-nut against turning.

5. 53625

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In testimony whereof I affix my signature. ~~in the presence of two witnesses.~~

~~Witnesses~~:

~~Inventor~~

Sign full name—WALTER L. SCHOENGARTH.

OATH

STATE OF MICHIGAN }
COUNTY OF GOGEBIC } ss.

WALTER L. SCHOENGARTH, the above-named petitioner, being sworn, deposes and says that he is a citizen of the United States of America, and resident of Ironwood, County of Gogebic, and State of Michigan; that he verily believes himself to be the original, first and sole inventor of the improvement in ADJUSTABLE GAS-ENGINE PISTONS, described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives, or assigns, more than twelve months prior to this application; and that no application for patent on said improvement has been filed by him or his representatives, or assigns, in any country foreign to the United States, ~~except as follows:~~

Sign *full* name—WALTER L. SCHOENGARTH.

Sworn to and subscribed before me this 27th day of July, 1915. Affix Seal Here.

HERMAN LARSON,
Notary Public.
Gogebic County, Michigan.

(Notarial Seal)

My commission expires July 29, 1917.

Fig 1.

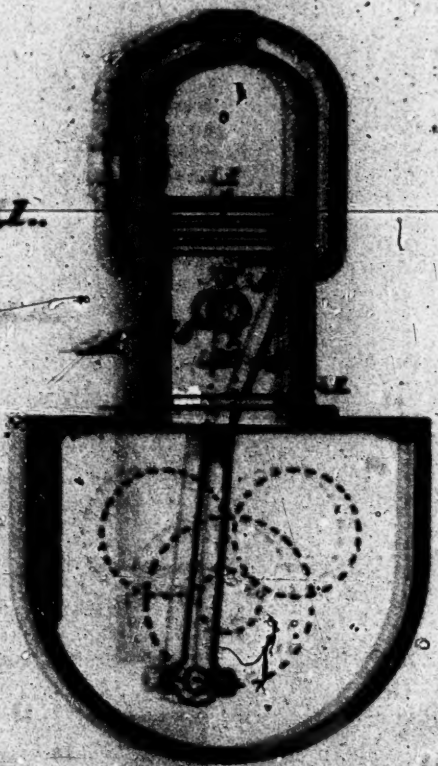


Fig 2.

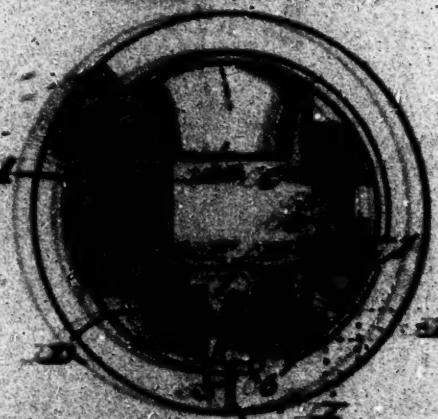
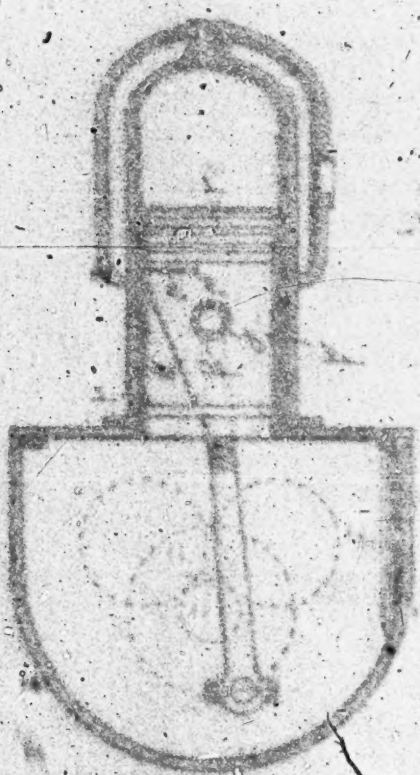


Fig 3.



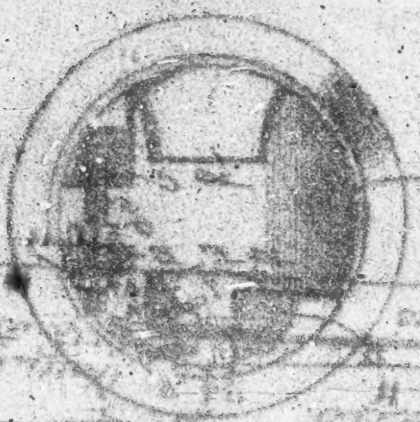


Fig. 2.

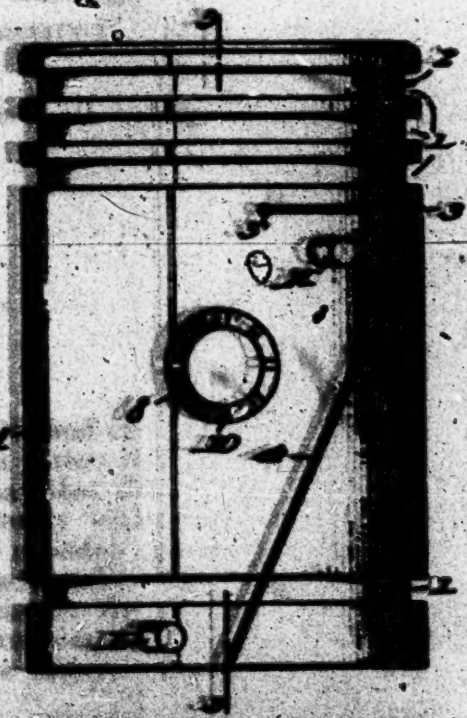
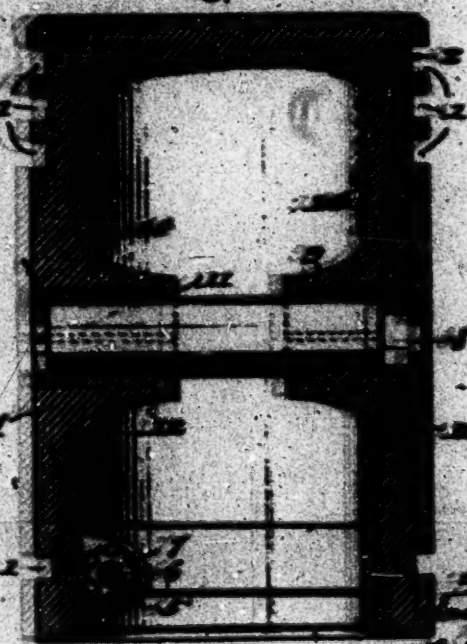
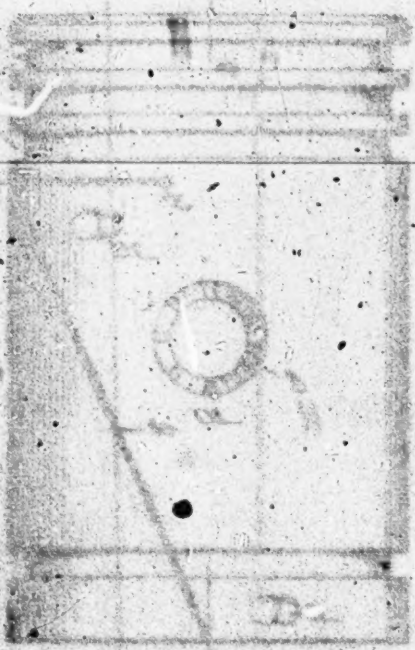
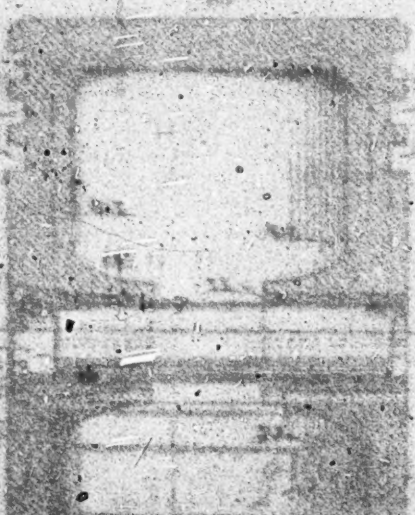


Fig. 3.



Inventor:
Witnesses:





DEFENDANTS' EXHIBIT 5-K$_{11}$.

Letter, dated April 2, 1917, from Louis Bagger & Co. to Walter Schoengarth.

(Filed January 27, 1934.)

Louis Bagger & Co.
Patent Attorneys
Barrister Building
635 F Street N. W.
Washington, D. C.

Washington, D. C.
April 2, 1917.

Mr. Walter Schoengarth,
202 Fredrick Street,
Ironwood, Mich.

Dear Sir:

Yours of the 26th ult., and express package containing model of New Form Piston just received and in reply, we are pleased to say that this construction, in our judgment, will come clearly within the terms of your claim 1 which calls for a piston having transverse and longitudinal slots and adjustable means located internally for expanding the piston. Your bolts or screws, have this function and they are located to all intents and purposes internally and we believe the claim fully covers this change.

Notwithstanding this however, we advocate an additional patent in a case like this because you really have a new and probably patentable feature in the way of these bolts and nuts, which by being located in the slots act, when tightened to spread or expand the piston.

The point is this, if you do not patent this there is always more or less danger of someone else doing so, even though in making such a thing they would infringe your patent and it is always far better to have too many patents than too few.

If we have not made all perfectly clear, let us know and we shall write you more at length.

Trusting you have gotten where you have begun to realize something on this invention, we remain.

Very truly yours,

Louis Bagger & Co.

VERNON E. HODGES
ATTORNEY AND COUNSELLOR AT LAW
PATENTS AND PATENT CAUSES
EARLE BLDG., 13TH & E STS., N. W
WASHINGTON, D. C.

DEFENDANTS EXHIBIT 5-K,
Envelope Sent to Walter L. Schoengarth at Cleveland.
(Filed January 27, 1934.)

VERNON E. HODGES
PATENT AND TRADE MARK LAWYER
608 F STREET NORTHWEST
WASHINGTON, D. C.

REMOVED TO EARLE BLDG.,
13TH & E STS., N. W.

MR. WALTER L. SCHOENGARTH,
Hotel Cleveland,
Cleveland,
Ohio.

8092

DEFENDANTS' EXHIBIT 5-M.

List of Patents to Packard Motor Co.

(Filed January 27, 1934.)

Number	Applicant	Issue Date	Filing Date	Invention
Re. 14,441	Vincent, Jesse G.	Mar. 5, 1918	Oct. 8, 1917	Motor-vehicle
1,304,733	Blaine, Walter E.	May 27, 1919	Sept. 10, 1917	Hydrocarbon-motor
1,315,050	Stout, William B.	Sept. 2, 1919	Nov. 8, 1917	Wheel
1,325,054	Stout, William B.	Dec. 16, 1919	Nov. 28, 1917	Aircraft
1,346,530	Church, Harold D.	Jul. 13, 1920	Sept. 29, 1917	Motor-vehicle
1,342,717	Lippa, Evrah C.	Jun. 8, 1920	Nov. 9, 1917	Metal-welding
1,345,943	McCain, George L.	Jul. 6, 1920	Sept. 29, 1917	Hydrocarbon-motor
1,356,641	McCain, George L.	Oct. 26, 1920	Sept. 15, 1917	Change-gear transmission
1,345,902	Vincent, Jesse G.	Jul. 6, 1920	Sept. 7, 1917	Pump for Motor-vehicle
1,382,954	Church, Harold D.	Jun. 28, 1921	Nov. 10, 1917	Hydrocarbon-motor
1,398,361	Church, Harold D.	Nov. 29, 1921	Aug. 8, 1917	Hydrocarbon-motor
1,374,066	Druar, Frank J.	Apr. 5, 1921	Nov. 17, 1917	Motor-vehicle
1,382,980	Hunt, Ormond E.	Jun. 28, 1921	Nov. 17, 1917	Battery-box
1,382,997	McCain, George L.	Jun. 28, 1921	Nov. 30, 1917	Pump-driving mechanism
1,377,858	Stout, William B.	May 10, 1921	Nov. 27, 1917	Aircraft
1,434,428	Church, Harold D.	Nov. 7, 1922	Oct. 12, 1917	Motor-vehicle
1,424,694	Vincent, Jesse G.	Aug. 1, 1922	Sept. 7, 1917	Motor-vehicle
1,455,986	Blaine, Walter E.	May 22, 1923	Aug. 8, 1917	Hydrocarbon motor
1,451,040	Gulick, Edward J.	Apr. 10, 1923	Nov. 30, 1917	Steering-rod connection
1,455,848	Moorehouse, Alfred	May 22, 1923	Sept. 28, 1917	Clutch
1,496,373	Hunt, Ormond E.	Jun. 3, 1924	Nov. 10, 1917	Aircraft
1,531,337	Hill, Lewis C.	Mar. 31, 1925	Oct. 26, 1917	Motor-vehicle.

CAPTION.

[Case No. 4046.]

UNITED STATES OF AMERICA,
NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION, SS.

Record of the proceedings of the District Court of the United States within and for the Eastern Division of the Northern District of Ohio, in the causes and matters hereinafter stated, the same being finally disposed of at a regular term of said court begun and held at the City of Cleveland, in said district, on the first Tuesday in April, being the third day of said month, in the year of our Lord one thousand nine hundred and thirty-four and in the one hundred and fifty-eighth year of the Independence of the United States of America, to-wit, on Friday, the 27th day of July, A. D. 1934.

Honorable PAUL JONES,
United States District Judge.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
vs.
THE ABERDEEN MOTOR SUPPLY COMPANY.
} No. 4046 EQUITY.

Said action was commenced on the 17th day of October, A. D. 1931 and proceeded to final disposition at the term and day above written and during the progress thereof pleadings and papers were filed, process was issued and returned and orders of the court were made and entered in the order and on the dates hereinafter stated, to-wit:

BILL OF COMPLAINT.

(Filed October 17, 1931.)

[Case No. 4046.]

The Bill of Complaint in Case No. 4046 is identical in wording, except as regards the name of the Defendant, with the Bill of Complaint in Case No. 4045 printed at pages 2 to 13, both inclusive, of Vol. I.

MOTION OF DEFENDANT, THE ABERDEEN MOTOR SUPPLY COMPANY, FOR FURTHER AND BETTER STATEMENT AND FURTHER PARTICULARS.

(Filed November 9, 1931.)

[Case No. 4046.]

This Motion in Case No. 4046 is identical in wording, except as regards the name of the Defendant, with a similar Motion in Case No. 4045 printed at pages 14 and 15, both inclusive, of Vol. I.

ORDER ON MOTION OF DEFENDANT, THE ABERDEEN MOTOR SUPPLY COMPANY, FOR FURTHER AND BETTER STATEMENT, AND FURTHER PARTICULARS.

(Entered December 30, 1931 by Paul Jones, Judge.)

[Case No. 4046.]

This Order in Case No. 4046 is identical in wording, except as regards the name of the Defendant, with a similar Order in Case No. 4045 printed at page 16 of Vol. I.

PLAINTIFFS' BILL OF PARTICULARS.

(Filed January 8, 1932.)

[Case No. 4046.]

Plaintiffs' Bill of Particulars in this case is identical in wording, except as regards the name of the Defendant, with Plaintiffs' Bill of Particulars in Case No. 4045 printed at pages 16 and 17, both inclusive, of Vol. I.

PETITION OF JOHN H. BRUNINGA FOR LEAVE TO ENTER HIS SPECIAL APPEARANCE, IN ORDER TO ENTER A SPECIAL APPEARANCE ON BEHALF OF STERLING PRODUCTS CORPORATION, FOR THE SOLE AND ONLY PURPOSE OF OBJECTING TO THE JURISDICTION.

(Filed November 9, 1931.)

[Case No. 4046.]

This Petition in Case No. 4046, is identical in wording with a similar Petition in Case No. 4045 printed at pages 18 to 20; both inclusive, of Vol. I.

PRINTER'S NOTE:

The Letters attached to the foregoing Petition in Case No. 4046 are identical with those attached to the Petition in Case No. 4045, printed at pages 21 to 25, both inclusive, of Vol. I.

ORDER OF COURT GRANTING PETITION OF JOHN H. BRUNINGA FOR LEAVE TO ENTER SPECIAL APPEARANCE OF STERLING PRODUCTS, TO OBJECT TO JURISDICTION.

(Entered December 30, 1931 by Paul Jones, Judge.)

[Case No. 4046.]

This Order in Case No. 4046 is identical with the similar Order in Case No. 4045 printed at page 25 of Vol. I.

ANSWER OF DEFENDANT, THE ABERDEEN MOTOR SUPPLY COMPANY, TO BILL OF COMPLAINT.

(Filed February 1, 1932.)

[Case No. 4046.]

The Answer to the Bill of Complaint in Case No. 4046 is identical in wording, except as regards the name of the Defendant, with a similar Answer in Case No. 4045 printed at pages 26 to 41, both inclusive, of Vol. I.

NOTICE BY DEFENDANT, THE ABERDEEN MOTOR SUPPLY COMPANY, OF INTENTION TO TAKE DEPOSITIONS.

(Filed February 15, 1932.)

[Case No. 4046.]

This Notice in Case No. 4046 is identical in wording, except as regards the name of the Defendant, with a similar Notice in Case No. 4045 printed at page 41 of Vol. I.

SUPPLEMENTAL NOTICES BY DEFENDANT, THE ABERDEEN MOTOR SUPPLY COMPANY, OF INTENTION TO TAKE DEPOSITIONS, ATTACHED TO VENNER ET AL. DEPOSITIONS.

(Filed January 9, 1933.)

[Case No. 4046.]

The Supplemental Notices in Case No. 4046 are identical in wording, except as regards the name of the Defendant, with similar Supplemental Notices in Case No. 4045 printed at page 42 of Vol. I.

ORDER FOR REFERENCE TO AND APPOINTMENT OF SPECIAL MASTER.

(Entered November 7, 1932 by Paul Jones, Judge.)

[Case No. 4046.]

This Order in Case No. 4046 is identical in wording with a similar Order in Case No. 4045 printed at pages 43 and 44, both inclusive, of Vol. I.

STIPULATION OF PLAINTIFFS AND DEFENDANT, THE ABERDEEN MOTOR SUPPLY COMPANY, CONSOLIDATING CAUSE NO. 4046 WITH CAUSES NOS. 4045 AND 4047 FOR TRIAL.

(Filed January 11, 1933.)

[Case No. 4046.]

This Stipulation in Case No. 4046 is identical in wording, except as regards the Captions and Numbers of the cases referred to therein, with the similar Stipulation in Case No. 4045, printed at pages 45 and 46, both inclusive, of Vol. I.

ORDER GRANTING STIPULATION CONSOLIDATING EQUITY CAUSE NO. 4046 WITH CAUSES NOS. 4045 AND 4047 FOR TRIAL, ETC.

(Entered January 11, 1933 by Paul Jones, Judge.)

[Case No. 4046.]

This Order in Case No. 4046 is identical in wording, except as regards the Captions and Numbers of the case referred to therein, with the similar Order in Case No. 4045 printed at pages 46 and 47, both inclusive, of Vol. I.

AMENDMENT TO ANSWER OF DEFENDANT, THE ABERDEEN MOTOR SUPPLY COMPANY.

(Filed April 19, 1933.)

[Case No. 4046.]

This Amendment to Answer in Case No. 4046 is identical in wording, except as regards the name of the Defendant, with a similar Amendment to Answer in Case No. 4045 printed at page 48 of Vol. I.

STIPULATION OF PLAINTIFFS AND DEFENDANT, THE ABERDEEN MOTOR SUPPLY COMPANY, RE NARRATIVE OF TRANSCRIPT.

(Filed October 26, 1934.)

[Case No. 4046.]

This Stipulation in Case No. 4046 is identical in wording, except as regards the name of the Defendant, with a similar Stipulation in Case No. 4045 printed at page 49 of Vol. I.

ORDER GRANTING STIPULATION OF PLAINTIFFS AND DEFENDANT, THE ABERDEEN MOTOR SUPPLY COMPANY, FOR FILING NARRATIVE FORM TESTIMONY IN ONE CAUSE WITH REFERENCE THERETO IN EACH OF OTHER TWO CAUSES.

(Entered October 26, 1934 by Paul Jones, Judge.)

[Case No. 4046.]

This Order in Case No. 4046 is identical in wording, except as regards the name of the Defendant, with the similar Order in Case No. 4045 printed at page 49 of Vol. I.

ORDER APPROVING NARRATIVE FORM OF TESTIMONY.

(Entered February 26, 1935 by Paul Jones, Judge.)

[Case No. 4046.]

This Order in Case No. 4046 is identical in wording with the similar Order in Case No. 4045 printed at page 50 of Vol. I.

ACKNOWLEDGMENT OF SERVICE OF NARRATIVE FORM OF TESTIMONY.

(Filed February 26, 1935.)

[Case No. 4046.]

This Acknowledgment of Service in Case No. 4046 is identical in wording with a similar Acknowledgment of Service in Case No. 4045 printed at page 51, Vol. I.

NARRATIVE FORM OF TESTIMONY.

(Filed February 26, 1935.)

[Case No. 4046.]

The Narrative Form of Testimony in Case No. 4046 is identical in every respect with that in Case No. 4045 printed at pages 51 to 587, both inclusive, of Vol. I, and pages 599 to 1091, both inclusive, of Vol. II.

PLAINTIFFS' EXHIBITS.

The Exhibits of Plaintiffs called for by the Praecipe in Case No. 4046 and those withdrawn by the Order of Withdrawal in Case No. 4046 are identical with those included in or withdrawn from Case No. 4045; those included appear on pages 1321 to 1584, both inclusive, of Vol. III.

DEFENDANTS' EXHIBITS.

The Exhibits of Defendants called for by the Praecipe in Case No. 4046 and those withdrawn by the Order of Withdrawal in Case No. 4046 are identical with those included in or withdrawn from Case No. 4045; those included appear on pages 1585 to 1808, both inclusive, of Vol. III and pages 1809 to 2329, both inclusive, of Vol. IV.

The Order of the Withdrawal of Exhibits in Case No. 4046 is identical in wording with that in Case No. 4045, which appears on pages 1280 to 1281, both inclusive, of Vol. II.

REPORT OF WILLIAM B. WOODS, SPECIAL MASTER.

(Filed January 27, 1934.)

[Case No. 4046.]

The Report of the Special Master in Case No. 4046 is identical in wording with that in Case No. 4045 printed on pages 1092 to 1189, both inclusive, of Vol. II.

PLAINTIFFS' EXCEPTIONS TO THE REPORT OF THE SPECIAL MASTER.

(Filed February 26, 1934.)

[Case No. 4046.]

Plaintiffs' Exceptions to the Report of the Special Master in Case No. 4046 are identical in wording with those in Case No. 4045 printed on pages 1190 to 1228, both inclusive, of Vol. II.

MEMORANDUM ON EXCEPTIONS TO MASTER'S REPORT.

(Filed July 6, 1934.)

[Case No. 4046.]

The Memorandum of Exceptions to Master's Report in Case No. 4046 is identical in wording with that in Case No. 4045, printed on page 1229 of Vol. II.

FINAL DECREE.

(Filed July 27, 1934.)

[Case No. 4046.]

The Final Decree in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1230 of Vol. II.

PETITION FOR APPEAL.

(Filed October 17, 1934.)

[Case No. 4046.]

The Petition for Appeal in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1231 of Vol. II.

ORDER ALLOWING APPEAL.

(Entered October 17, 1934 by Paul Jones, Judge.)

[Case No. 4046.]

The Order Allowing Appeal in Case No. 4046 is identical in wording with that in Case No. 4045 printed on pages 1231 and 1232, both inclusive, of Vol. II.

ASSIGNMENT OF ERRORS.

(Filed October 17, 1934.)

[Case No. 4046.]

The Assignment of Errors in Case No. 4046 is identical in wording with that in Case No. 4045 printed on pages 1232 to 1250, both inclusive, of Vol. II.

CITATION.

(Filed October 20, 1934.)

[Case No. 4046.]

The Citation in Case No. 4046 is identical in wording, except as regards the name of the Appellee, with that in Case No. 4045 printed on page 1251 of Vol. II.

BOND ON APPEAL.

(Filed October 23, 1934.)

[Case No. 4046.]

The Bond on Appeal in Case No. 4046 is identical in wording, except as regards the name of the Appellee, with that in Case No. 4045 printed on pages 1253 and 1254, both inclusive, of Vol. II.

ORDERS EXTENDING TIME.

[Case No. 4046.]

The Orders in Case No. 4046 Extending Time for Lodging the Narrative, filing Praecipe and filing the Transcript of Record in the United States Circuit Court of Appeals are identical with those in Case No. 4045 printed on pages 1255 to 1265, both inclusive, of Vol. II.

These Orders of Extension are abbreviated as follows:

Time Extended	*For Filing Praecipe and/or Lodging Narrative*	*For Filing Record In U. S. C. C. of A.*
From	*To*	*To*
Oct. 26/34	Nov. 24/34	Dec. 16/34
Nov. 22/34	Dec. 14/34	Dec. 26/34
Dec. 13/34	Dec. 21/34	.....
Dec. 20/34	Dec. 31/34	Jan. 25/35
Dec. 31/34	Jan. 14/35	.....
Jan. 14/35	Jan. 28/35	Feb. 23/35
Jan. 23/35	Feb. 18/35	.....
Feb. 18/35	Feb. 25/35	Mar. 25/35
Feb. 25/35	Mar. 15/35	.....
Mar. 15/35	Apr. 15/35	Apr. 25/35
Apr. 16/35	May 6/35	May 16/35
May 14/35	.....	June 15/35
June 12/35	.....	Aug. 15/35
Aug. 15/35	.....	Sept. 30/35

STIPULATION THAT APPEALS IN CAUSES NOS. 4045, 4046 AND 4047 BE CONSOLIDATED IN ONE PRINTED TRANSCRIPT OF RECORD, THAT EXHIBITS USED THEREIN MAY BE USED IN EACH OF SAID CAUSES AND THAT REPETITION OF SIMILAR PLEADINGS IN EACH BE ELIMINATED.

(Filed March 2, 1935.)

[Case No. 4046.]

This Stipulation in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1266 of Vol. II.

ORDER CONSOLIDATING APPEALS IN ONE PRINTED TRANSCRIPT OF RECORD, THAT EXHIBITS USED THEREIN MAY BE USED IN EACH OF SAID CAUSES, AND FURTHER ORDERING ELIMINATION OF REPETITION OF SIMILAR PLEADINGS IN EACH CAUSE.

(Entered March 2, 1935 by Paul Jones, Judge.)

[Case No. 4046.]

This Order in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1267 of Vol. II.

STIPULATION RE DIGEST OF EXHIBITS.

(Filed May 4, 1935.)

[Case No. 4046.]

This Stipulation in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1267 of Vol. II.

ORDER GRANTING STIPULATION RE DIGEST OF EXHIBITS.

(Entered May 4, 1935 by Paul Jones, Judge.)

[Case No. 4046.]

This Order in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1268 of Vol. II.

PRAECIPE.

(Filed May 6, 1935.)

[Case No. 4046.]

The Praecipe in Case No. 4046 is identical in wording with that in Case No. 4045 printed on pages 1269 to 1272, both inclusive, of Vol. II.

STIPULATION RE CERTIFICATION OF RECORD.

(Filed May 6, 1935.)

[Case No. 4046.]

The Stipulation Re Certification of Record in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1273 of Vol. II.

DEFENDANTS' MOTION FOR LEAVE TO ADD TO THE RECORD IN THE ABOVE-ENTITLED CASE DEFENDANTS' COUNTER PRAECIPE AND CERTAIN LETTERS.

(Filed May 14, 1935.)

[Case No. 4046.]

This Motion in Case No. 4046 is identical in wording with that in Case No. 4045 printed on pages 1273 to 1277, both inclusive, of Vol. II.

ORDER DENYING MOTION OF DEFENDANTS FOR LEAVE TO ADD TO RECORD DEFENDANTS' COUNTER PRAECIPE AND CERTAIN LETTERS.

(Entered May 15, 1935 by Paul Jones, Judge.)

[Case No. 4046.]

This Order in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1277 of Vol. II.

PETITION TO SUPPLY LAST EIGHT PAGES MISSING FROM PLAINTIFFS' EXHIBIT 13 IN THE ABOVE CAUSE ON APPEAL.

(Filed June 18, 1935.)

[Case No. 4046.]

This Petition in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1278 of Vol. II.

ORDER GRANTING LEAVE TO SUPPLY LAST EIGHT PAGES OF PLAINTIFFS' EXHIBIT NO. 13.

(Entered June 18, 1935 by Paul Jones, Judge.)

[Case No. 4046.]

This Order in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1278 of Vol. II.

DEFENDANTS' COUNTER PRAECIPE.

(Filed June 27, 1935.)

[Case No. 4046.]

Defendants' Counter Praecipe in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1279 of Vol. II.

ORDER SETTLING CONTENTS OF RECORD.

(Entered July 6, 1935 by Paul Jones, Judge.)

[Case No. 4046.]

Order Settling Contents of Record in Case No. 4046 is identical in wording with that in Case No. 4045 printed on page 1279 of Vol. II.

ORDER FOR WITHDRAWAL OF EXHIBITS.

(Entered September 4, 1935 by Paul Jones, Judge.)

[Case No. 4046.]

Order for Withdrawal of Exhibits in Case No. 4046 is identical in wording with that in Case No. 4045 printed on pages 1280 and 1281, both inclusive, of Vol. II.

CAPTION.

[Case No. 4047.]

UNITED STATES OF AMERICA,
NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION, ss.

Record of the proceedings of the District Court of the United States within and for the Eastern Division of the Northern District of Ohio, in the cause and matter hereinafter stated, the same being finally disposed of at a regular term of said court begun and held at the City of Cleveland, said district, on the first Tuesday in April, being the third day of said month, in the year of our Lord one thousand nine hundred and thirty-four and in the one hundred and fifty-eighth year of the Independence of the United States of America, to-wit, on Friday, the 27th day of July A. D. 1934.

Honorable PAUL JONES,
United States District Judge.

THE CLEVELAND TRUST COMPANY,
CHEVISLER CORPORATION,

vs.

THE F. E. ROWE SALES COMPANY.

No. 4047 EQUITY.

Said action was commenced on the 17th day of October, A. D. 1931 and proceeded to final disposition at the term and day above written and during the progress thereof pleadings and papers were filed, process was issued and returned, and orders of the court were made and entered in the order and on the dates hereinafter stated, to-wit:

BILL OF COMPLAINT.

(Filed October 17, 1931.)

[Case No. 4047.]

The Bill of Complaint in Case No. 4047 is identical in wording, except as regards the name of the Defendant, with the Bill of Complaint in Case No. 4045 printed at pages 2 to 13, both inclusive, of Vol. I.

MOTION OF DEFENDANT, THE F. E. ROWE SALES COMPANY, FOR FURTHER AND BETTER STATEMENT AND FURTHER PARTICULARS.

(Filed November 9, 1931.)

[Case No. 4047.]

This Motion in Case No. 4047 is identical in wording, except as regards the name of the Defendant, with a similar Motion in Case No. 4045 printed at pages 14 and 15, both inclusive, of Vol. I.

ORDER ON MOTION OF DEFENDANT, THE F. E. ROWE SALES COMPANY, FOR FURTHER AND BETTER STATEMENT AND FURTHER PARTICULARS.

(Entered December 30, 1931 by Paul Jones Judge.)

[Case No. 4047.]

This Order in Case No. 4047 is identical in wording, except as regards the name of the Defendant, with a similar Order in Case No. 4045 printed at page 16 of Vol. I.

PLAINTIFFS' BILL OF PARTICULARS.

(Filed January 8, 1932.)

[Case No. 4047.]

Plaintiffs' Bill of Particulars in this case is identical in wording, except as regards the name of the Defendant, with Plaintiffs' Bill of Particulars in Case No. 4045 printed at pages 16 and 17, both inclusive, of Vol. I.

PETITION OF JOHN H. BRUININGA FOR LEAVE TO ENTER SPECIAL APPEARANCE, IN ORDER TO ENTER A SPECIAL APPEARANCE ON BEHALF OF STERLING PRODUCTS CORPORATION, FOR THE SOLE AND ONLY PURPOSE OF OBJECTING TO THE JURISDICTION.

(Filed November 9, 1951.)

[Case No. 4047.]

This Petition in Case No. 4047, is identical in wording with a similar Petition in Case No. 4045 printed at pages 18 to 20, both inclusive, of Vol. I.

PRINTER'S NOTE:

The Letters attached to the foregoing Petition in Case No. 4047 are identical with those attached to the Petition in Case No. 4045, printed at pages 21 to 25, both inclusive, of Vol. I.

ORDER OF COURT GRANTING PETITION OF JOHN H. BRUININGA FOR LEAVE TO ENTER SPECIAL APPEARANCE OF STERLING PRODUCTS, TO OBJECT TO JURISDICTION.

(Entered December 30, 1951 by Paul Jones, Judge.)

[Case No. 4047.]

This Order in Case No. 4047 is identical with the similar Order in Case No. 4045 printed at page 25 of Vol. I.

ANSWER OF DEFENDANT, HERT. K. ROWE SALES COMPANY, TO BILL OF COMPLAINT.

(Filed February 1, 1952.)

[Case No. 4047.]

The Answer to the Bill of Complaint in Case No. 4047 is identical in wording, except as regards the name of the Defendant, with a similar Answer in Case No. 4045 printed at pages 26 to 31, both inclusive, of Vol. I.

NOTICE BY DEFENDANT, THE F. E. BOWE SALES COMPANY, OF INTENTION TO TAKE DEPOSITIONS.

(Filed February 15, 1932.)

[Case No. 4047.]

This Notice in Case No. 4047 is identical in wording, except as regards the name of the Defendant, with a similar Notice in Case No. 4045 printed at page 41 of Vol. I.

SUPPLEMENTAL NOTICES BY DEFENDANT, THE F. E. BOWE SALES COMPANY, OF INTENTION TO TAKE DEPOSITIONS, ATTACHED TO WEEKES ET AL. DEPOSITIONS.

(Filed January 9, 1933.)

[Case No. 4047.]

The Supplemental Notices in Case No. 4047 are identical in wording, except as regards the name of the Defendant, with similar Supplemental Notices in Case No. 4045 printed at page 42 of Vol. I.

ORDER FOR REFERENCE TO AND APPOINTMENT OF SPECIAL MASTER.

(Entered November 7, 1933 by Paul Jones, Judge.)

[Case No. 4047.]

This Order in Case No. 4047 is identical in wording, with a similar Order in Case No. 4045 printed at pages 43 and 44, both inclusive, of Vol. I.

STIPULATION OF PLAINTIFF AND DEFENDANT, THE F. E. BOWE SALES COMPANY, CONSOLIDATING CAUSES NO. [illegible] AND [illegible] FOR TRIAL.

(Filed January 11, 1933.)

[Case No. 4047.]

This Stipulation in Case No. 4047 is identical in wording, except as regards the Captions and Numbers of the cases referred to therein, with the similar Stipulation in Case No. 4045, printed at pages 45 and 46, both inclusive, of Vol. I.

ORDER GRANTING STIPULATION CONSOLIDATING EQUITY CAUSE NO. 4047 WITH CAUSES NOS. 4045 AND 4046 FOR TRIAL, ETC.

(Entered January 11, 1933 by Paul Jones, Judge.)

(Case No. 4047.)

This Order in Case No. 4047 is identical in wording, except as regards the Captions and Numbers of the case referred to therein, with the similar Order in Case No. 4045 printed at pages 46 and 47, both inclusive, of Vol. I.

AMENDMENT TO ANSWER OF DEFENDANT, THE F. E. BOWE SALES COMPANY.

(Filed April 19, 1933.)

(Case No. 4047.)

This Amendment to Answer in Case No. 4047 is identical in wording, except as regards the name of the Defendant, with a similar Amendment to Answer in Case No. 4045 printed at page 48 of Vol. I.

STIPULATION OF PLAINTIFF AND DEFENDANT, THE F. E. BOWE SALES COMPANY, RE NARRATIVE OF TRANSCRIPT.

(Filed October 26, 1934.)

(Case No. 4047.)

This Stipulation in Case No. 4047 is identical in wording, except as regards the name of the Defendant, with a similar Stipulation in Case No. 4045 printed at page 49 of Vol. I.

ORDER GRANTING STIPULATION OF PLAINTIFF AND DEFENDANT, THE F. E. BOWE SALES COMPANY, FOR FILING NARRATIVE FORM TRANSCRIPT IN CASES NOS. 4045 AND 4047 CONSOLIDATED FOR TRIAL AND APPEAL BY ORDER OF COURT, TWO CAUSES,

(Entered October 26, 1934 by Paul Jones, Judge.)

(Case No. 4047.)

This Order in Case No. 4047 is identical in wording, except as regards the name of the Defendant, with the similar Order in Case No. 4045 printed at page 49 of Vol. I.

ORDER APPROVING NARRATIVE FORM OF TESTIMONY.

(Entered February 26, 1935 by Paul Jones, Judge.)

[Case No. 4047.]

This Order in Case No. 4047 is identical in wording with the similar Order in Case No. 4045 printed at page 50 of Vol. I.

ACKNOWLEDGMENT OF SERVICE OF NARRATIVE FORM OF TESTIMONY.

(Filed February 26, 1935.)

[Case No. 4047.]

This Acknowledgment of Service in Case No. 4047 is identical in wording with a similar Acknowledgment of Service in Case No. 4045 printed at page 51, Vol. I.

NARRATIVE FORM OF TESTIMONY.

(Filed February 26, 1935.)

[Case No. 4047.]

The Narrative Form of Testimony in Case No. 4047 is identical in every respect with that in Case No. 4045 printed at pages 51 to 567, both inclusive, of Vol. I, and pages 569 to 1091, both inclusive, of Vol. II.

PLAINTIFFS' EXHIBITS.

The Exhibits of Plaintiffs called for by the Praecipe in Case No. 4047 and those withdrawn by the Order of Withdrawal in Case No. 4047 are identical with those included in or withdrawn from Case No. 4045; those included appear on pages 1321 to 1584, both inclusive, of Vol. III.

DEFENDANTS' EXHIBITS.

The Exhibits of Defendants called for by the Praecipe in Case No. 4047 and those withdrawn by the Order of Withdrawal in Case No. 4047 are identical with those included in or withdrawn from Case No. 4045; those included appear on pages 1585 to 1808, both inclusive, of Vol. III and pages 1809 to 2339, both inclusive, of Vol. IV.

The Order of the Withdrawal of Exhibits in Case No. 4047 is identical in wording with that in Case No. 4045, which appears on pages 1280 to 1281, both inclusive, of Vol. II.

REPORT OF WILLIAM B. WOODS, SPECIAL MASTER.

(Filed January 27, 1934.)

[Case No. 4047.]

The Report of the Special Master in Case No. 4047 is identical in wording with that in Case No. 4045 printed on pages 1092 to 1189, both inclusive, of Vol. II.

PLAINTIFFS' EXCEPTIONS TO THE REPORT OF THE SPECIAL MASTER.

(Filed February 26, 1934.)

[Case No. 4047.]

Plaintiffs' Exceptions to the Report of the Special Master in Case No. 4047 are identical in wording with those in Case No. 4045 printed on pages 1190 to 1228, both inclusive, of Vol. II.

MEMORANDUM ON EXCEPTIONS TO MASTER'S REPORT.

(Filed July 6, 1934.)

[Case No. 4047.]

The Memorandum on Exceptions to Master's Report in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1229 of Vol. II.

FINAL DECREE.

(Filed July 27, 1934.)

[Case No. 4047.]

The Final Decree in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1230 of Vol. II.

PETITION FOR APPEAL.

(Filed October 17, 1934.)

[Case No. 4047.]

The Petition for Appeal in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1231 of Vol. II.

ORDER ALLOWING APPEAL.

(Entered October 17, 1934 by Paul Jones, Judge.)

[Case No. 4047.]

The Order Allowing Appeal in Case No. 4047 is identical in wording with that in Case No. 4045 printed on pages 1231 and 1232, of Vol. II.

ASSIGNMENT OF ERRORS.

(Filed October 17, 1934.)

[Case No. 4047.]

The Assignment of Errors in Case No. 4047 is identical in wording with that in Case No. 4045 printed on pages 1232 to 1250, both inclusive, of Vol. II.

CITATION.

(Filed October 20, 1934.)

[Case No. 4047.]

The Citation in Case No. 4047 is identical in wording, except as regards the name of the Appellee, with that in Case No. 4045 printed on page 1251 of Vol. II.

BOND ON APPEAL.

(Filed October 23, 1934.)

[Case No. 4047.]

The Bond on Appeal in Case No. 4047 is identical in wording, except as regards the name of the Appellee, with that in Case No. 4045 printed on pages 1253 and 1254, both inclusive, of Vol. II.

[illegible]

[Case No. 4047.]

The Orders in Case No. 4047 Extending Time for Lodging the Narrative, filing Praecipe and filing the Transcript of Record in the United States Circuit Court of Appeals are identical with those in Case No. 4045 printed on pages 1255 to 1265, both inclusive, of Vol. II.

These Orders of Extension are abbreviated as follows:

Time Extended From	For Filing Praecipe and/or Lodging Narrative To	For Filing Record In U. S. C. C. of A. To
Oct. 26/34	Nov. 24/34	Dec. 16/34
Nov. 22/34	Dec. 14/34	Dec. 26/34
Dec. 13/34	Dec. 21/34	.....
Dec. 20/34	Dec. 31/34	Jan. 25/35
Dec. 31/34	Jan. 14/35	.....
Jan. 14/35	Jan. 28/35	Feb. 23/35
Jan. 23/35	Feb. 18/35	.....
Feb. 18/35	Feb. 25/35	Mar. 25/35
Feb. 25/35	Mar. 15/35	.....
Mar. 15/35	Apr. 15/35	Apr. 25/35
Apr. 16/35	May 6/35	May 16/35
May 14/35	.....	June 15/35
June 12/35	.....	Aug. 15/35
Aug. 15/35	.....	Sept. 30/35

[illegible]

(Filed March 2, 1935.)

[Case No. 4047.]

This Stipulation in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1266 of Vol. II.

ORDER CONSOLIDATING APPEALS IN ONE PRINTED TRANSCRIPT OF RECORD, THAT EXHIBITS USED THEREIN MAY BE USED IN EACH OF SAID CAUSES, AND FURTHER ORDERING ELIMINATION OF REPETITION OF SIMILAR PLEADINGS IN EACH CAUSE.

(Entered March 2, 1935 by Paul Jones, Judge.)

[Case No. 4047.]

This Order in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1267 of Vol. II.

STIPULATION RE DIGEST OF EXHIBITS.

(Filed May 4, 1935.)

[Case No. 4047.]

This Stipulation in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1267 of Vol. II.

ORDER GRANTING STIPULATION RE DIGEST OF EXHIBITS.

(Entered May 4, 1935 by Paul Jones, Judge.)

[Case No. 4047.]

This Order in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1268 of Vol. II.

PRAECIPE.

(Filed May 6, 1935.)

[Case No. 4047.]

The Praecipe in Case No. 4047 is identical in wording with that in Case No. 4045 printed on pages 1269 to 1272, both inclusive, of Vol. II.

STIPULATION RE CERTIFICATION OF RECORD.

(Filed May 6, 1935.)

[Case No. 4047.]

The Stipulation Re Certification of Record in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1273 of Vol. II.

DEFENDANTS' MOTION FOR LEAVE TO ADD TO THE RECORD IN THE ABOVE ENTITLED CAUSE DEFENDANTS' COUNTER PRAECIPE AND CERTAIN LETTERS.

(Filed May 14, 1935.)

[Case No. 4047.]

This Motion in Case No. 4047 is identical in wording with that in Case No. 4045 printed on pages 1273 to 1277, both inclusive, of Vol. II.

ORDER DENYING MOTION OF DEFENDANTS FOR LEAVE TO ADD TO RECORD DEFENDANTS' COUNTER PRAECIPE AND CERTAIN LETTERS.

(Entered May 15, 1935 by Paul Jones, Judge.)

[Case No. 4047.]

This Order in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1277 of Vol. II.

PETITION TO SUPPLY LAST EIGHT PAGES MISSING FROM PLAINTIFFS' EXHIBIT 13 IN THE ABOVE CAUSE ON APPEAL.

(Filed June 18, 1935.)

[Case No. 4047.]

This Petition in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1278 of Vol. II.

ORDER GRANTING LEAVE TO SUPPLY LAST EIGHT PAGES OF PLAINTIFFS' EXHIBIT NO. 13.

(Entered June 18, 1935 by Paul Jones, Judge.)

[Case No. 4047.]

This Order in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1278 of Vol. II.

DEFENDANTS' COUNTER PRAECIPE.

(Filed June 27, 1935.)

[Case No. 4047.]

Defendants' Counter Praecipe in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1279 of Vol. II.

ORDER SETTLING CONTENTS OF RECORD.

(Entered July 6, 1935 by Paul Jones, Judge.)

[Case No. 4047.]

Order Settling Contents of Record in Case No. 4047 is identical in wording with that in Case No. 4045 printed on page 1279 of Vol. II.

ORDER FOR WITHDRAWAL OF EXHIBITS.

(Entered September 4, 1935 by Paul Jones, Judge.)

[Case No. 4047.]

Order for Withdrawal of Exhibits in Case No. 4047 is identical in wording with that in Case No. 4045 printed on pages 1280 and 1281, both inclusive, of Vol. II.

ORDER EXTENDING TIME FOR FILING TRANSCRIPT OF RECORD IN UNITED STATES CIRCUIT COURT OF APPEALS.

(Entered September 25, 1935 by Paul Jones, Judge.)

[Case No. 4045.]

It is hereby ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including October 10th, 1935.

Jones,
United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 25th day of September, 1935.

Evans & McCoy,
Attorneys for Plaintiffs.

Kyes, Hudson & Kent,
Attorneys for Defendant.

PRINTER'S NOTE:

An Order Extending Time, identical in wording with the foregoing, was entered September 25, 1935 in each of cases Nos. 4046 and 4047.

CERTIFICATE OF CLERK

NORTHERN DISTRICT OF OHIO, ss.:

I, F. J. Dengler, Clerk of the United States District Court within and for said district, do hereby certify that the foregoing printed pages contain a full, true and complete copy of the records and all proceedings in the consolidated causes of Nos. 4045, 4046 and 4047 Equity, including the petitions for appeal, assignments of error, orders allowing appeal, bonds on appeal, and other pleadings in accordance with the praecipes for transcript filed herein; the originals of which papers, except certain original exhibits withdrawn by leave of court, remain in my custody as clerk of said court.

There are also attached hereto and transmitted herewith the citations issued and allowed herein.

In Testimony Whereof, I have hereunto signed my name and affixed the seal of said court at Cleveland, in said district this ..... day of October, A. D. 1935 and in the one hundred and sixtieth year of the Independence of the United States of America.

F. J. DENGLER, *Clerk*,

(Seal) By C. B. WATKINS,
Chief Deputy.

Vol. V

TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1938

No. 3

THE SCHRIBER-SCHROTH COMPANY,
PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 4

THE ABERDEEN MOTOR SUPPLY COMPANY,
PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 5

THE F. E. ROWE SALES COMPANY, PETITIONER,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

ON WRITS OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT.

PETITION FOR CERTIORARI FILED JANUARY 7, 1939.

CERTIORARI GRANTED MAY 31, 1939.

United States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants,* vs. THE SCHRIBER-SCHROTH COMPANY, *Defendant-Appellee.*	No. 4045. EQUITY.
THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants,* vs. THE ABERDEEN MOTOR SUPPLY COMPANY, *Defendant-Appellee.*	No. 4046. EQUITY.
THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants,* vs. THE F. E. ROWE SALES COMPANY, *Defendant-Appellee.*	No. 4047. EQUITY.

APPEALS FROM
THE DISTRICT COURT OF THE UNITED STATES,
FOR THE NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION.

SUPPLEMENTARY TRANSCRIPT OF RECORD.

EVANS & McCOY,
Bulkley Bldg., Cleveland, Ohio,
RICHEY & WATTS,
Union Trust Bldg., Cleveland, Ohio,
Attorneys for Plaintiffs-Appellants.

JOHN H. BRUNINGA,
Railway Exchange Bldg., St. Louis, Missouri,
KWIS, HUDSON & KENT,
Union Trust Bldg., Cleveland, Ohio,
Attorneys for Defendants-Appellees.

THE GOLDE LEGAL PUBLISHING CO., CLEVELAND, OHIO

United States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants*, vs. THE SCHRIBER-SCHROTH COMPANY, *Defendant-Appellee.*	No. 4045. EQUITY.
THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants*, vs. THE ABERDEEN MOTOR SUPPLY COMPANY, *Defendant-Appellee.*	No. 4046. EQUITY.
THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Plaintiffs-Appellants*, vs. THE F. E. ROWE SALES COMPANY, *Defendant-Appellee.*	No. 4047. EQUITY.

APPEALS FROM
THE DISTRICT COURT OF THE UNITED STATES,
FOR THE NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION.

SUPPLEMENTARY TRANSCRIPT OF RECORD.

EVANS & MCCOY,
Bulkley Bldg., Cleveland, Ohio,
RICHEY & WATTS,
Union Trust Bldg., Cleveland, Ohio,
Attorneys for Plaintiffs-Appellants.

JOHN H. BRUNINGA,
Railway Exchange Bldg., St. Louis, Missouri,
KWIS, HUDSON & KENT,
Union Trust Bldg., Cleveland, Ohio,
Attorneys for Defendants-Appellees.

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Equity No. 4046.

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CAPTION.

UNITED STATES OF AMERICA,
NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION, ss.

Record of the proceedings of the District Court of the United States within and for the Eastern Division of the Northern District of Ohio, in the causes and matters hereinafter stated, the same being finally disposed of at a regular term of said court begun and held at the City of Cleveland, in said district, on the first Tuesday in April, being the third day of said month, in the year of our Lord one thousand nine hundred and thirty-four and in the one hundred and fifty-eighth year of the Independence of the United States of America, to-wit, on Friday, the 27th day of July, A. D. 1934.

Honorable PAUL JONES,
United States District Judge.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
vs.
THE ABERDEEN MOTOR SUPPLY COMPANY.

No. 4046.
EQUITY.

Said action was commenced on the 17th day of October, A. D. 1931 and proceeded to final disposition at the term and day above written and during the progress thereof pleadings and papers were filed, process was issued and returned and orders of the court were made and entered in the order and on the dates hereinafter stated, to-wit:

ASSIGNMENT OF ERRORS.

(Filed April 17, 1936.)

[Case No. 4046.]

Now come plaintiffs, The Cleveland Trust Company and Chrysler Corporation, and present with their accompanying petition for appeal from the final decree entered herein, the following assignment of errors, which are hereinafter grouped with respect to subject matter:

GROUP A.

Assignment of errors relating to the validity of Gulick patent No. 1,815,733.

1. The Court erred in failing to find and hold the Gulick patent No. 1,815,733 good and valid in law, particularly as to claims 1, 11, 12, 13, 15, 18, 22, 27, 28, 29, 30, 33, 35, 36, 37, 38, 41, 42 and 43 thereof, and in failing to sustain plaintiffs' exceptions Nos. 2, 3 and 101.

Assignments 2 to 27, inclusive, same as in case 4045 (R. pp. 1233 to 1239).

GROUP B.

Assignment of errors relating to infringement of the Gulick patent in suit.

28. The Court erred in not holding that defendant has infringed the Gulick patent No. 1,815,733, particularly as to claims 1, 11, 12, 13, 15, 18, 22, 27, 28, 29, 30, 33, 35, 36, 37, 38, 41, 42 and 43 thereof, and in failing to sustain plaintiffs' exceptions Nos. 45 and 102.

29. The Court erred in approving and adopting the Special Master's finding of fact No. 38:

> "That defendants' pistons, Exs. 1, * * * and 8 do not embody the structure, function and mode of operation of the Gulick patent in suit."

and in not sustaining plaintiffs' exception (No. 44) to the aforesaid finding of fact No. 38.

30. The Court erred in approving and adopting the Special Master's finding of fact No. 43 and in not sustaining plaintiffs' exception (No. 54) to the following statements and conclusions in the aforesaid finding of fact No. 43:

(a) "* * * that the prior art requires restriction of the (Gulick) patent to the employment of webs which are of sufficient length and thinness to

permit flexing of those webs at the top of the skirt;

(b) that Exhibit 1 does not employ such characteristic webs;

(c) that Exhibit 8 does not employ such characteristic webs; * * * ."

Assignment 31 same as in case 4045 (R. p. 1240).

32. The Court erred in approving and adopting the Special Master's finding of fact No. 49,

"That such construction and arrangement (of the connectors from the head to the wrist pin boss in Exhibit 8) does not secure the mode of operation contemplated by the Gulick and Jardine patents."

and in not sustaining plaintiff's exception (No. 60) to the aforesaid finding of fact No. 49.

33. The Court erred in approving and adopting the Special Master's finding of fact No. 51:

"That defendants' pistons, Exs. 1, * * * 8 and 9 employ the essential structure, function and mode of operation of the prior art, more particularly the Franquist patent No. 1,153,902 and Exs. 8 and 9, also the Chenard & Walcker French patent No. 468,595."

and in not sustaining plaintiffs' exception (No. 62) to the aforesaid finding of fact No. 51.

34. The Court erred in approving and adopting the Special Master's conclusion of law No. 37:

"That defendant's pistons, Exs. 1, * * * and 8 do not infringe the Gulick patent in suit."

and in not sustaining plaintiffs' exception (No. 89) to the aforesaid finding of fact No. 49.

GROUP C.

Assignment of errors relating to validity of the Jardine patent No. 1,763,523.

Assignments 35 to 41, inclusive, same as 34 to 40, inclusive, in case 4045 (R. pp. 1241 to 1242).

GROUP D.

Assignment of errors relating to infringement of Jardine patent in suit.

Assignment 42 same as 41 in case 4045 (R. p. 1242).

43. The Court erred in approving and adopting the Special Master's finding of fact No. 39:

> "That defendants' pistons, Exhibits 1, * * * and 8 do not embody the structure, function and mode of operation of the Jardine patent in suit."

and in not sustaining plaintiffs' exception (No. 46) to the aforesaid finding of fact No. 39.

44. The Court erred in approving and adopting the Special Master's finding of fact No. 44 and in not sustaining plaintiffs' exception (No. 55) to the following statements and conclusions in finding of fact No. 44:

(a) "* * * that the prior art requires restriction of the patent (Jardine) to the employment of webs which are of sufficient lengths and thinness to permit flexing of these webs at the top of the skirt;

(b) that Ex. 1 does not employ such characteristic webs;

(c) that Ex. 8 does not employ such characteristic webs."

45. The Court erred in approving and adopting the Special Master's conclusion of law No. 38:

> "That defendants' pistons, Exs. 1, * * * and 8 do not infringe the Jardine patent in suit."

and in not sustaining plaintiffs' exception (No. 90) to the aforesaid conclusion of law No. 38.

Groups and Assignments 46 to 67, inclusive, same as 45 to 66, inclusive, in case 4045 (R. pp. 1243 to 1247).

GROUP H.

Assignment of errors relating to infringement of Mooers patent in suit.

Assignment 68 same as 67 in case 4045 (R. p. 1248).

69. The Court erred in approving and adopting the Special Master's finding of fact No. 41:

> "That defendants' pistons, Exs. 1, * * * 8 and 9 do not embody the structure, function and mode of operation of the Mooers patent in suit."

and in not sustaining plaintiffs' exception (No. 50) to the aforesaid finding of fact No. 41.

70. The Court erred in approving and adopting the Special Master's finding of fact No. 46 and in not sus-

taining plaintiffs' exception (No. 57) to the following statements and conclusions included in the Special Master's finding of fact No. 46:

(a) "* * * that the prior art requires such a restriction; (of the connectors from the head to the top of the skirt in the Mooers patent to narrow connectors of restricted cross sections);

(b) that in Exs. 1, * * * 8 and 9 the connectors are heavy and not of a structure as described in the Mooers patent * * *."

71. The Court erred in approving and adopting the Special Master's conclusion of law No. 40:

"That defendants' pistons, Exs. 1, * * * 8 and 9 do not infringe the Mooers patent in suit."

and in not sustaining plaintiffs' exception (No. 92) to the aforesaid conclusion of law No. 40.

Groups and Assignments 72 to 82, inclusive, same as 71 to 81, inclusive, in case 4045 (R. pp. 1248 to 1250).

SUPPLEMENTARY PRAECIPE.

(Filed April 17, 1936.)

[Case No. 4046.]

To the Clerk:—

Please prepare a supplementary transcript of record for the Circuit Court of Appeals, Sixth Circuit, in the above entitled cause, including the following:

1. Caption.

2. Assignment of Errors (per copy attached).

3. This Supplementary Praecipe.

4. Clerk's Certificate.

Please deliver these documents, above noted, to The Gates Legal Publishing Company.

RICHEY & WATTS.
Counsel for Plaintiffs.

The foregoing praecipe, together with the Assignment of Errors as attached hereto and setting forth assignments of errors differing from the assignments of errors printed in full in Equity No. 4045 has been agreed upon by counsel for the respective parties subject to the approval of the Court for the purpose of supplying omissions from the printed record. The Assignments of Errors were inadvertently not included in the consolidated record on appeal of causes in Equity Nos. 4045, 4046, 4047.

It is further stipulated that the supplemental transcript of record be consolidated in form to agree with the main Consolidated Transcript of record on appeal of causes in Equity Nos. 4045, 4046 and 4047, and entitled Cleveland Trust Company and Chrysler Corporation vs. The Schriber-Schroth Company, No. 4045; Cleveland Trust Company and Chrysler Corporation v. The Aberdeen Motor Supply Company, No. 4046; and Cleveland Trust Company and Chrysler Corporation v. The F. E. Rowe Sales Company, No. 4047.

RICHEY & WATTS,
Counsel for Plaintiffs.

April 7, 1936.

Without waiving other objections to record.

JOHN H. BRUNINGA,
Counsel for Defendant.

April 15, 1936.
Dated: April 17, 1936.

APPROVED:

JONES,
United States District Judge.

CAPTION.

UNITED STATES OF AMERICA,
NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION, ss.

Record of the proceedings of the District Court of the United States within and for the Eastern Division of the Northern District of Ohio, in the causes and matters hereinafter stated, the same being finally disposed of at a regular term of said court begun and held at the City of Cleveland, in said district, on the first Tuesday in April, being the third day of said month, in the year of our Lord one thousand nine hundred and thirty-four and in the one hundred and fifty-eighth year of the Independence of the United States of America, to-wit, on Friday, the 27th day of July, A. D. 1934.

Honorable PAUL JONES,
United States District Judge.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
vs.
THE F. E. ROWE SALES COMPANY.
} No. 4047. Equity.

Said action was commenced on the 17th day of October, A. D. 1931 and proceeded to final disposition at the term and day above written and during the progress thereof pleadings and papers were filed, process was issued and returned and orders of the court were made and entered in the order and on the dates hereinafter stated, to-wit:

ASSIGNMENT OF ERRORS.

(Filed April 17, 1936.)

[Case No. 4047.]

Now come plaintiffs, The Cleveland Trust Company and Chrysler Corporation, and present with their accompanying petition for appeal from the final decree entered herein, the following assignment of errors, which are hereinafter grouped with respect to subject matter:

GROUP A.

Assignment of errors relating to the validity of Gulick patent No. 1,815,733.

1. The Court erred in failing to find and hold the Gulick patent No. 1,815,733 good and valid in law, particularly as to claims 1, 4, 11, 12, 13, 15, 18, 22, 27, 28, 29, 30, 33, 34, 35, 36, 37, 38, 41, 42 and 43 thereof, and in failing to sustain plaintiffs' exceptions Nos. 2, 3, and 101.

Assignments 2 to 27 inclusive, same as in case 4045. (R. pp. 1233 to 1259.)

GROUP B.

Assignment of errors relating to infringement of the Gulick patent in suit.

28. The Court erred in not holding that defendant has infringed the Gulick patent No. 1,815,733, particularly as to claims 1, 4, 11, 12, 13, 15, 18, 22, 27, 28, 29, 30, 33, 34, 35, 36, 37, 38, 41, 42 and 43 thereof, and in failing to sustain plaintiffs' exceptions Nos. 45 and 102.

29. The Court erred in approving and adopting the Special Master's finding of fact No. 38,

> "That defendants' pistons, Exs. 1, BBB, CCC, 3-J, 3-O and 8 do not embody the structure, function and mode of operation of the Gulick patent in suit."

and in not sustaining plaintiffs' exception (No. 44) to the aforesaid finding of fact No. 38.

30. The Court erred in approving and adopting the Special Master's finding of fact No. 43 and in not sustaining plaintiffs' exception (No. 54) to the following statements and conclusions in the aforesaid finding of fact No. 43:

(a) "* * * that the prior art requires restriction of the (Gulick) patent to the employment of webs

which are of sufficient length and thinness to permit flexing of those webs at the top of the skirt;

(b) that Exhibit 1 does not employ such characteristic webs;

(c) that Exhibit 8 does not employ such characteristic webs; and

(d) that Exhibits BBB and CCC * * * employ no webs at all."

Assignment 31 same as in case 4045 (R. p. 1240).

32. The Court erred in approving and adopting the Special Master's finding of fact No. 49,

"That such construction and arrangement (of the connectors from the head to the wrist pin boss in Exhibit 8) does not secure the mode of operation contemplated by the Gulick and Jardine patents."

and in not sustaining plaintiffs' exception (No. 60) to the aforesaid finding of fact No. 49.

33. The Court erred in approving and adopting the Special Master's finding of fact No. 50 and in not sustaining plaintiffs' exception (No. 61) to the following statements and conclusions in the said finding of fact No. 50:

"That Exs. BBB and CCC * * * do not employ any webs connecting the head with the skirt and, therefore, no webs of such flexibility as contemplated by the Gulick, Jardine and even Maynard patents, if the latter has such webs having such characteristics."

34. The Court erred in approving and adopting the Special Master's finding of fact No. 51,

"That defendants' pistons, Exs. 1, BBB, CCC, 3-J, 3-O, 8 and 9 employ the essential structure, function and mode of operation of the prior art, more particularly the Franquist patent No. 1,153,902 and Exs. 8 and 9, also the Chenard & Walcker French patent No. 463,595."

and in not sustaining plaintiffs' exception (No. 62) to the aforesaid finding of fact No. 51.

35. The Court erred in approving and adopting the Special Master's conclusion of law No. 37,

"* * * that defendants' pistons, Exs. 1, BBB, CCC, 3-J, 3-O and 8 do not infringe the Gulick patent in suit."

and in not sustaining plaintiffs' exception (No. 89) to the aforesaid conclusion of law.

GROUP C.

Assignment of errors relating to validity of the Jardine patent No. 1,763,523.

Assignments 36 to 42, inclusive, same as assignments 34 to 40, inclusive, of case 4045 (R. pp. 1241 to 1242).

GROUP D.

Assignment of errors relating to infringement of Jardine patent in suit.

Assignment 43 same as 41 in case 4045 (R. pp. 1242).

44. The Court erred in approving and adopting the Special Master's finding of fact No. 39,

"That defendants' pistons, Exhibits 1, BBB, CCC, and 8 do not embody the structure, function and mode of operation of the Jardine patent in suit."

and in not sustaining plaintiffs' exception (No. 46) to the aforesaid finding of fact No. 39.

45. The Court erred in approving and adopting the Special Master's finding of fact No. 44 and in not sustaining plaintiffs' exception (No. 55) to the following statements and conclusions in finding of fact No. 44:

(a) "* * * that the prior art requires restriction of the patent (Jardine) to the employment of webs which are of sufficient lengths and thinness to permit flexing of these webs at the top of the skirt;

(b) That Ex. 1 does not employ such characteristic webs;

(c) that Ex. 8 does not employ such characteristic webs;

(d) that Exs. BBB and CCC employ no webs at all."

46. The Court erred in approving and adopting the Special Master's conclusion of law No. 38,

"That defendants' pistons, Exs. 1, BBB, CCC and 8 do not infringe the Jardine patent in suit."

and in not sustaining plaintiffs' exception (No. 90) to the aforesaid conclusion of law No. 38.

GROUP E.

Assignment of errors relating to validity of the Maynard patent No. 1,655,968.

Assignments 47 to 56, inclusive, same as 45 to 54, inclusive, in case 4045 (R. pp. 1243 to 1245).

GROUP F.

Assignment of errors relating to infringement of Maynard patent in suit.

Assignment 57 same as 55 in case 4045 (R. p. 1245).

58. The Court erred in approving and adopting the Special Master's finding of fact No. 40,

"That defendants' pistons, Exs. 1, BBB, CCC do not embody the structure, function and mode of operation of the Maynard patent in suit."

and in not sustaining plaintiffs' exception (No. 48) to the aforesaid finding of fact No. 40.

59. The Court erred in approving and adopting the Special Master's finding of fact No. 45 and in not sustaining plaintiffs' exception (No. 56) to the following statements in the Special Master's finding of fact No. 45:

(a) "That the Maynard patent in suit describes a piston structure in which automatic compensation is not secured unless the groove E is cut into the webs F sufficiently and beyond the inside of the piston head flange to secure web extensions at the top of sufficient length and thinness to permit flexing of these web extensions at the top of the skirt;

(b) that Ex. 1 does not employ such characteristic webs; and

(c) that Exs. BBB and CCC employ no webs at all."

60. The Court erred in approving and adopting the Special Master's conclusion of law No. 39,

"That the defendants' pistons, Exs. 1, BBB, CCC do not infringe the Maynard patent in suit."

and in not sustaining plaintiffs' exception (No. 91) to the aforesaid conclusion of law No. 39.

GROUP G.

Assignment of errors relating to validity of Mooers patent No. 1,402,309.

Assignments 61 to 68, inclusive, same as 59 to 66, inclusive, in case 4045 (R. pp. 1246 to 1247).

GROUP H.

Assignment of errors relating to infringement of Mooers patent in suit.

Assignment 69 same as 67 of case 4045 (R. p. 1248).

70. The Court erred in approving and adopting the Special Master's finding of fact No. 41;

> "That defendants' pistons, Exs. 1, BBB, CCC, 3-O, 8 and 9 do not embody the structure, function and mode of operation of the Mooers patent in suit."

and in not sustaining plaintiffs' exception (No. 50) to the aforesaid finding of fact No. 41.

71. The Court erred in approving and adopting the Special Master's finding of fact No. 46 and in not sustaining plaintiffs' exception (No. 57) to the following statements and conclusions included in the Special Master's finding of fact No. 46:

(a) "* * * that the prior art requires such a restriction; (of the connectors from the head to the top of the skirt in the Mooers patent to narrow connectors of restricted cross sections);

(b) that in Exs. 1, BBB, CCC, 3-O, 8 and 9 the connectors are heavy and not of a structure as described in the Mooers patent * * *."

72. The Court erred in approving and adopting the Special Master's conclusion of law No. 40:

> "That defendants' pistons, Exs. 1, BBB, CCC, 3-O, 8 and 9 do not infringe the Mooers patent in suit."

and in not sustaining plaintiffs' exception (No. 92) to the aforesaid conclusion of law No. 40.

Remaining groups and Assignments 73 to 83, inclusive, same as 71 to 81 of case 4045 (R. pp. 1249 to 1250).

SUPPLEMENTARY PRAECIPE.

(Filed April 17, 1936.)

[Case No. 4047.]

To the Clerk:

Please prepare a supplementary transcript of record for the Circuit Court of Appeals, Sixth Circuit, in the above entitled cause, including the following:—

1. Caption.
2. Assignment of Errors (per copy attached).
3. This Supplementary Praecipe.
4. Clerk's Certificate.

Please deliver these documents, above noted, to The Gates Legal Publishing Company.

RICHEY & WATTS,
Counsel for Plaintiffs.

The foregoing praecipe, together with the Assignment of Errors as attached hereto and setting forth assignments of errors differing from the assignments of errors printed in full in Equity No. 4045 has been agreed upon by counsel for the respective parties subject to the approval of the Court for the purpose of supplying omissions from the printed record. The Assignments of Errors were inadvertently not included in the consolidated record on appeal of causes in Equity Nos. 4045, 4046, 4047.

It is further stipulated that the supplemental transcript of record be consolidated in form to agree with the main Consolidated Transcript of record on appeal of causes in Equity Nos. 4045, 4046 and 4047, and entitled Cleveland Trust Company and Chrysler Corporation v. The Schriber-Schroth Company, No. 4045; Cleveland Trust Company and Chrysler Corporation v. The Aberdeen Motor Supply Company, No. 4046; and Cleveland Trust Company and Chrysler Corporation v. The F. E. Rowe Sales Company, No. 4047.

RICHEY & WATTS,
Counsel for Plaintiffs.

April 7, 1936.

Without waiving other objections to record.

JOHN H. BRUNINGA,
Counsel for Defendant.

April 15, 1936.

Dated: April 17, 1936.

Approved: JONES,
United States District Judge.

CERTIFICATE OF CLERK.

NORTHERN DISTRICT OF OHIO, ss.:

I, F. J. Dengler, Clerk of the United States District Court within and for said district, do hereby certify that the foregoing printed pages contain a full, true and complete copy of the pleadings in Equity Nos. 4046 and 4047 in accordance with the Supplementary Praecipe for transcript of record filed herein, the originals of which papers remain in my custody as clerk of said court.

In Testimony Whereof, I have hereunto signed my name and affixed the seal of said court at Cleveland, in said district, this . . day of April, A. D. 1936 and in the One hundred and sixtieth year of the Independence of the United States of America.

F. J. DENGLER,
Clerk,

(Seal)

By C. B. WATKINS,
Chief Deputy.

[fol. 2379] PROCEEDINGS IN THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT

Causes Argued and Submitted May 4, 1937

Before Hicks, Simons and Allen, JJ.

These causes are argued by Newton D. Baker and F. O. Richey for Appellants and by J. H. Brunings and J. H. Sutherland for Appellees and are submitted to the court.

DECREE No. 7223—Filed October 8, 1937

Appeal from the District Court of the United States for the Northern District of Ohio

This cause came on to be heard on the transcript of the record from the District Court of the United States for the Northern District of Ohio, and was argued by counsel.

On Consideration Whereof, It is now here ordered, adjudged and decreed by this Court that the decree of the said District Court in this cause be and the same is hereby set aside and the cause remanded for the entry of a decree granting the usual relief of injunction and accounting in respect to the infringement of claims 1, 11, 12, 13, 15, 18, 30 and 33 of Gulick, and claims 1, 6 and 8 of Maynard patent, which claims are valid and infringed by the Sterling piston, exemplified by Exhibit 1, and dismissing the bill with respect to the alleged infringements of Jardine, Mooers and Schmiedeknecht without prejudice. Costs of the appeal will be borne by the defendant.

[fol. 2380] DECREE No. 7224—Filed October 8, 1937

Appeal from the District Court of the United States for the Northern District of Ohio

This cause came on to be heard on the transcript of the record from the District Court of the United States for the Northern District of Ohio, and was argued by counsel.

On Consideration Whereof, It is now here ordered, adjudged and decreed by this Court that the decree of the said

District Court in this cause be and the same is hereby set aside and the cause remanded for the entry of a decree granting the usual relief of injunction and accounting in respect to the infringement of claims 1, 11, 12, 13, 15, 18, 30 and 33 of Gulick, and claims 1, 6 and 8 of Maynard patent, which claims are valid and infringed by the Sterling piston, exemplified by Exhibit 1, and dismissing the bill with respect to the alleged infringements of Jardine, Mooers and Schmiedeknecht without prejudice. Costs of the appeal will be borne by the defendant.

Decree No. 7225—Filed October 8, 1937

Appeal from the District Court of the United States for the Northern District of Ohio

This cause came on to be heard on the transcript of the record from the District Court of the United States for the Northern District of Ohio, and was argued by counsel.

On Consideration Whereof, It is now here ordered, adjudged and decreed by this Court that the decree of the said District Court in this cause be and the same is hereby set aside and the cause remanded for the entry of a decree granting the usual relief of injunction and accounting in respect to the infringement of claims 1, 11, 12, 13, 15, 18, 30 and 33 of Gulick, and claims 1, 6 and 8 of Maynard patent, which claims are valid and infringed by the Sterling piston, exemplified by Exhibit 1, and dismissing the bill with respect to the alleged infringements of Jardine, Mooers and Schmiedeknecht without prejudice. Costs of the appeal will be borne by the defendant.

OPINION—Filed October 8, 1937

[fol. 2381] [Stamp:] Filed Oct. 8, 1937. John W. Menzies, Clerk

Nos. 7223-4-5

UNITED STATES CIRCUIT COURT OF APPEALS, SIXTH CIRCUIT

No. 7223

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Appellants,

v.

THE SCHREIBER-SCHROTH COMPANY, Appellee

No. 7224

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Appellants,

v.

THE ABERDEEN MOTOR SUPPLY COMPANY, Appellee

No. 7225

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Appellants,

v.

THE F. E. ROWE SALES COMPANY, Appellee

Appeals from the District Court of the United States for the Northern District of Ohio, Eastern Division

Decided October 8, 1937

Before Hicks, Simons and Allen, Circuit Judges

SIMONS, Circuit Judge:

In a study of the patents and prior art involved in Wahkesha Motor Co. v. Willys Overland, Inc., 77 Fed. (2d) 906, and The Perfect Circle Co. v. Hastings Mfg. Co., 88 Fed. (2d) 813, we learned something of the principles

of operation and the mechanics employed in the conventional four-cycle internal combustion engine of the modern [fol. 2382] motor car. It will therefore be unnecessary here to repeat what was there said in reference thereto. In the first we considered the explosion chamber, and in the second the piston ring. In the present infringement suit we deal with the piston.

In the rapid reciprocation of a piston within the cylinder, as in the references described, the desirability of maintaining a close fit was obvious and had long been recognized. This was necessary to avoid waste of power through gases being permitted to pass below the piston from the explosion chamber, a condition known as "blow-by," to prevent lubricating oil passing above the piston into the explosion chamber, a condition known as "pumping oil," and to prevent the slapping of the piston in the cylinder, making for a noisy engine and tending to break its parts. On the other hand a too close fit would, because of the expansion of the piston by the great heat generated in the cylinder, cause it to bind or "seize" therein, thus stalling the engine or perhaps even wrecking it.

Cylinders were and generally still are cast of iron, and prior to the period we are here considering pistons were likewise so cast. The disadvantages in this organization were early recognized. Since iron is a poor conductor of heat, the particles of carbon that would form on the cylinder head would become overheated and cause premature explosion in the combustion chamber. Iron is also heavy, and with the great acceleration of piston reciprocation, due to the ever increasing demand for speed, the industry began to cast about for expedients to lighten the pistons. There were numerous efforts and failures in this respect with the conventional iron trunk piston. Lighter metals were considered, but since strength and durability to withstand the great force of rapid explosions upon the piston head and the powerful thrust imparted to its bearing faces by the power stroke of the piston as it imparted energy to the crank shaft were prerequisites, the art was limited to metal that was both strong and durable. It turned, therefore, quite naturally and inevitably, to aluminum. A new and for a long time seemingly insuperable problem at once confronted the automotive engineers, due to the fact that the coefficient of expansion differs greatly in the two metals,

and that under heat aluminum will expand much more rapidly than iron. Since the desirable clearance is minute, approximating one one-thousandth of an inch, it was at once clear that an aluminum piston, installed when cold with required clearance in an iron cylinder, would when heated by operation seize, and that a piston with clearance [fol. 2383] sufficient to avoid seizing would waste power, pump oil, cause undesirable noises, and lack durability.

Ingenious, numerous and varied were the expedients resorted to in an effort to achieve the clearly recognized advantages of aluminum pistons, while at the same time avoiding troublesome results, and equally numerous were the failures, by reason of which a prejudice had developed in the industry against them, and it was said they had had a "black eye."

The Cleveland Trust Company, appellant, is the repository of numerous patent rights assigned to it by inventors and by piston and automobile manufacturers, and it is its contention that the aluminum piston problem was completely solved by some of its assignors, and that a structure embodying the disclosures of the patent to Jardine, No. 1,763,523, granted June 10, 1930, but in a more specific and improved form described in Maynard No. 1,655,968, granted January 10, 1928, but on an application later than Jardine's, had gone into wide commercial use, being accepted by the industry, with the exception of some divisions of the General Motors Corporation, had sold in the tens of millions, and is now infringed by pistons of the appellees. The Jardine and Maynard patents belong to the Trust Company. Conceiving, however, that a Gulick application, which was being prosecuted by the Packard Motor Car Company, would, with its broader claims, dominate both Jardine and Maynard, the Trust Company purchased it and prosecuted it to successful conclusion after numerous interferences, the patent issuing as Gulick No. 1,815,733, on July 21, 1931. The Trust Company also owns Schmiedeknecht patent No. 1,256,265, granted February 12, 1918, and Meeers, No. 1,402,309, granted January 3, 1922, both for pistons, and seven accused devices are all alleged to infringe some of the claims of some or all of the five patents.

The appellees are three Cleveland dealers who have sold alleged infringing pistons manufactured by the Sterling Products Corporation of St. Louis, Missouri. While the

manufacturer was named in the original bills of complai
they were dismissed as to it, it being understood, howeve
that Sterling Products Corporation was conducting t
defense of the three suits. By stipulation they were co
solidated below, and all are before this court upon t
same record. At the outset only two alleged infringi
devices were involved, one a Sterling piston known as E
hibit 1, and the other a Ray-Day piston known as Exhibit
During the progress of the trial five additional structur
were introduced as infringements. While there is no fin
[fol. 2384] ing to that effect, it seems to have been assume
that all of the alleged infringing devices were sold by ea
of the three defendants. The consolidated cause was r
ferred to a master, whose very detailed findings of fa
and conclusions of law were affirmed by the District Judg
without discussion and decrees entered dismissing the bill
While the Chrysler Corporation appears as party plainti
below and as co-appellant here, it has never entered it
appearance and its presence in the case as a nominal plain
tiff is due to the fact that it owns a half interest in th
Maynard patent and was therefore joined as party plain
tiff. An issue raised below as to the propriety of Chrys
ler being made a nominal party is abandoned here, sinc
the defendants have not appealed.

The controversy is involved and has been bitterly fough
The record is voluminous, the exhibits, physical and other
wise, numerous, the patent office history discloses persisten
challenge, and of eighty-odd claims fifty-two are said t
be infringed. While we have given careful consideratio
to the briefs and record, it is manifest that the necessities
of the case and the desirable limit of an opinion will per
mit us to discuss only the more salient features of the con
troversy, with perhaps summary disposition of its lesse
issues, for the challenge to the validity of the patents and
to the fact of their infringement includes most if not al
of the defenses known to the patent law.

We deal first with the patent to Gulick, in agreemen
with the contention that if valid it is basic. Gulick has
been connected with various motor car and motor cycle
manufacturing companies in a number of capacities, in
cluding that of factory manager. He was also an inven
tor, having prosecuted some fifty applications in the paten
office. As early as 1908 he had a conception of a split and

flexible piston, but did nothing more for several years than to make sketches. In 1911 he made some experiments with modified standard iron pistons, giving them block tests in a motor cycle and in an Excelsior motor. The motor was later put into a Renault car and given a substantial road test. These early pistons were scrapped. In 1914 he made his first test with aluminum pistons in an Amplex car, which he used personally for some 4500 to 5300 miles. In 1917, along with other patents and patent applications, Gulick assigned his inchoate rights to the Packard Motor Car Company, and the application for the piston patent was filed by it on November 30th of that year. There followed long discussions with the examiners, administrative reviews, bitterly contested interferences, and appeals to [fol. 2385] the Court of Appeals of the District of Columbia (Long v. Gulick, 17 Fed. [2d] 686), and to the Court of Customs and Patent Appeals (Hartog v. Long, 47 Fed. [2d] 369). There had also been amendments to the original application at the instance of the inventor's assignee. It was not until July 21, 1931, that the Gulick patent issued with its forty-three claims.

The Gulick patent is for a combination of elements, many, if not indeed all of which, are to be found in the prior art. Nowhere, however, is found his precise organization, and the question at once presents itself as to whether there was exercise of the inventive faculty in the concept of their combination, for that a new result was achieved and a new mode of operation of an aluminum piston in its iron cylinder brought about is not successfully challenged on this record. Gulick separated the smaller ring carrying head of the piston from the somewhat larger skirt by a groove or air gap. This tends to prevent the passage of heat from the head directly to the skirt and permits the bearing faces of the skirt to yield to pressure independently of the head. The wrist pin bosses are pulled inwardly from the skirt periphery, and instead of being supported by the skirt are carried from the piston head by depending flanges, thus providing a vertically rigid support for the bosses with freedom of lateral motion in a direction at right angles to the load thrusts on the piston. The surface of the skirt where the bosses are connected to the head in conventional pistons was cut away or relieved, so that the bosses are not directly constrained by the cylinder

wall. They are held in place by webs extending in the general direction of load thrusts on the piston. One bearing face of the skirt is slotted vertically from the bottom edge up to and connecting with the air gap. That Spillman and Mooers patent 1,092,870, and Franquist patent 1,153,902 showed air gaps between piston head and skirt, or that splitting the piston skirt vertically or combining the vertical and longitudinal splits into the so-called T-slot were old practices, is not conclusive on the question of invention.

Since the cylinder head is the first to heat, and becomes hotter than the skirt it had always been machined with greater clearance, the control of oil and gas flow being taken care of in part at least by the piston rings, which function as a packing. See Perfect Circle Co. v. Hastings, supra. The problem of maintaining a close fit between an aluminum piston and an iron cylinder without seizing under heat expansion is a problem involving the skirt, which guides the piston and carries the bearings for the wrist pin, [fol. 2386] upon which is exerted the thrusts of the connecting rod through the cycle of reciprocation. To decelerate the flow of heat from piston head to skirt by an air gap was perhaps an obvious expedient in the art. To slit the skirt vertically so that pressure of the cylinder wall would compensate for thermal expansion was perhaps not beyond expected skill in the art. Minute relief of the cylinder periphery in the region of the bosses was shown in Franquist. But to combine insulation of head from skirt, retraction of the bosses from the skirt periphery, connection of such bosses to the skirt with webs laterally flexible and yet so carried from the head as to support the load upon the wrist pin with sufficient strength and rigidity, and to utilize the mechanical force of the cylinder wall upon the skirt and the thermal expansion of the bosses so as to compensate evenly and fully for head expansion and to secure a balanced flexibility of the skirt with no bending concentration at any point therein, discloses, we think, a meritorious concept beyond the reach of those skilled in the art. Franquist, of course, does disclose the broad concept of a flexible skirt. But Franquist gives no hint at all of the Gulick invention. His flexibility was obtained by grooves on the accordion principle, which while they interrupted the outer periphery of the piston skirt, did not destroy its inner unity. Some flexibility no doubt it had, but certainly

not in the sense that Gulick disclosed it, and it is doubtful that the Franquist piston could have met the severe tests required by the industry. And of commercial history it has none upon this record.

Probably the most difficult task that confronts a patent court lies in determining whether there is invention in a combination whereof many or all cooperating elements are old, and when concepts, however remarkable when disclosed, have in a rapidly developing art already become commonplace, not only to the expert but to the unskilled. It is not easy after the lapse of years to evaluate advances with the "eye and the understanding" of those in the field when they were made. Inventive concept is an abstraction impossible to define, and so courts have sought for simple rules by which its presence may be detected. These have proved helpful, even though never absolute. Long recognition of an existing problem in any art, and the advantages to accrue to an industry from its solution, coupled with repeated failures to find solution, has ever been considered as highly persuasive of invention when success is finally attained. Sometimes achievement is revolutionary, an abandonment of all previous approaches, and the chart-[fol. 2387] ing of a new way to the goal. More often the inventor begins where others leave off, and perceives the vital forward step to which predecessors had been blind. Even then success may not be fully recognised until the world gives acclaim.

The present record is conclusive of the long unsuccessful search for a light weight piston sufficiently durable to obviate the well-known disadvantages of the iron trunk piston in high speed engines. There was much research and experimentation by those most highly skilled, including the engineers of the Aluminum Company, Colonel Vincent of the Packard Motor Car Company, one of the designers of the Liberty engine, and the engineering staff of the Franklin Automobile Company, under the direction of the defendants' expert Stellmann, its Chief Engineer. Limited success may here and there have been attained, but the problem in its full sweep was not solved until the Gulick concept, carried forward to some extent by Maynard, with possibly some instruction from Jardine, reached commercial embodiment. Then and then only did the industry by acceptance of the Aluminum Company's piston answering the Maynard draw-

ing and specification, recognize the complete solution of the problem, and the many millions that have since been sold and used have set the seal of commercial approval upon such solution. It is idle to say in an imperfect world that invention should be denied because no piston, not even Maynard, performs perfectly.

It is, of course, axiomatic that commercial success is not of itself conclusive upon the question of novelty or invention, and where such success is fairly attributable to other causes, such as the reputation of the manufacturer, his extensive advertising and superior salesmanship, it will be wanting in persuasiveness. But where no alternative inferences are to be drawn, commercial success is highly indicative of invention. This is so in the usual case where the test of success is acceptance by the public. But it must be here noted if not elsewhere observed, that where success follows acceptance by experts rather than by those unskilled, it is of far greater tribute to the ingenuity of the inventor. It is clearly demonstrated upon this record, if indeed it is not within the field of general knowledge, that the automotive industry in acceptance of new devices upon which success of highly complicated and delicate machinery in the hands of inexpert users must depend, exercises the greatest caution, and things new, whatever their theoretical virtue, will not be considered until they have been subjected to the most rigorous practical tests for efficiency and durability. [fol. 2388] This must be so when failure of one year's product may bring tremendous losses or complete disaster.

So also with respect to the presumption that attaches to the validity of a grant by the Patent Office. Where, as in this case, substantially all pertinent prior art has been cited against the patent, where in hard fought interferences novelty and invention have been challenged, and where priority of conception has been finally adjudicated only upon repeated review in both administrative and judicial forums, the patent should not be stricken down except upon very clear and convincing proof of invalidity. The weight to be given this presumption has been so recently and so thoroughly discussed, and the rule stated in all the varying formulae by which courts have announced and affirmed it, in Radio Corporation v. Radio Laboratories, 293 U. S. 1, that it is unnecessary here to repeat or to cite additional cases.

In what we have said thus far it is perhaps clear that in respect to novelty and invention over recorded prior art we have concluded the Gulick patent to be valid. But this is not the whole controversy with respect to it. It is the contention of the defendant that the Gulick patent is invalid because abandoned by him prior to his application, and because it had been in public use in this country for more than two years before such application within the purview of R. S. §§4886, 4920. The Master so held. His findings were based on the fact that Gulick's 1911 and 1914 pistons had been scrapped, and on inference that Gulick's expressed satisfaction with his 1914 experimentation was conclusive of the completion of his invention in that year. That there had been no formal abandonment or disclaimer is clear. The Master's findings are based upon constructive abandonment deduced from the above circumstances and delay in applying for a patent.

Questions relevant to actual or to constructive abandonment of inventions are questions of fact, Walker, 6th Ed., §152; Kendall v. Winsor, 21 How. 330, and much weight must therefore be given to the findings of the Master, who saw and heard the witnesses. Consideration should also be given to the rule that concurrent findings of Master and Judge should not be set aside except for clear error, although this may prove to be an unsafe guide to just decision where exceptions to a Master's report are unilluminated by oral argument and a decree entered without elucidation of the reasons upon which it is based. The law, however, in reference to abandonment, requires that every reasonable doubt relevant to any such question should be resolved in favor of [fol. 2389] the patent, for it does not favor forfeiture. Walker, §152 and cases there cited. It was said by this court, Gear Grinding Machine Co. v. Studebaker Corp., 270 Fed. 934, 936: "Abandonment depends upon intent, actual or imputed. The actual intent did not exist, and the circumstances do not require that the intent be by law imputed as against the truth." That Gulick did not intend to abandon the subject matter of his invention seems to us clear. From the beginning of his experimentation in 1911 he made drawings from time to time, tests with slotted iron pistons and later with slotted aluminum pistons, and was at the same time not only busy in the earning of a livelihood but with plans for the purchase from a receiver of the prop-

erty of the Amplex Motor Car Company. The scrapping of his experimental pistons was without his knowledge or consent, and the fact that he replaced the experimental pistons of the Result car with standard pistons before its sale negatives any inference that the experimental pistons were intended to be abandoned. Distinction must also be made between abandonment of the subject matter of a patent and abandonment of crude experimental devices. While Gulick variously expressed satisfaction with the performance of his experimental pistons, it is clear upon review of his entire evidence that what he had then in mind was that they performed satisfactorily in reference to clearance. They had not demonstrated their strength and durability, or that they were properly designed or machined for commercial use.

The Master was largely influenced by the fact that Gulick's clarification of his testimony followed a recess, and gave little credence to it. We have reviewed it carefully. That Gulick's experiments were not completed to the end that a practical piston had been fully designed and tested seems clear. He is in some respects corroborated and in no wise impeached. Mere suspicion as to his good faith is not such clear and convincing proof of abandonment as will satisfy every reasonable doubt and sustain the heavy burden which rests upon those challenging the validity of his patent. The Master did not apply to the evidence on the issue of abandonment that standard of proof required to establish it and so the question is one of law, and the finding must be rejected.

There was no public use of the Gulick invention more than two years prior to the application so as to invalidate the patent. So long as use by the inventor can fairly be considered experimental and collateral to the development of the invention in its complete form, the bar of the statute does not begin to run. Beo Motor Car Co. v. Gear Grinding Co., 42 Fed. (2d) 965 (C. C. A. 6). The emphasis that is laid [fol. 2390] upon Gulick's use of a car with experimental pistons for business and pleasure for a considerable period does not impress us. Road tests of many thousands of miles are considered necessary to determine the efficiency of an engine and its parts. That such transportation is not wanted does not of itself constitute a public use. As we said in the second Gear Grinding case: "We see no principle in the precedents or in the policy of the statute which would re-

quire a valuable invention to be lost by permitting the bar to begin to run while the invention * * * is being gradually improved and developed up to the point of ascertaining whether it has real utility. Nor can it rightly be said that a public use of a developing and incomplete invention—incomplete as finally claimed—can nevertheless operate as a public use bar because adding the final element of perfection did not involve invention as compared with the earlier form to which it was added."

We are not convinced that the Gulick application was broadened to include new matter after intervening rights had arisen. This issue was adjudicated in the Court of Appeals of the District of Columbia, 17 Fed. (2d) 365, and the Court of Customs and Patent Appeals, 47 Fed. (2d) 366, 367. With the conclusions there reached we agree. As to the Monckmeir and Schoengarth prior uses, it is sufficient to say without analysis of the voluminous evidence, that they rest mainly upon the uncertain memory of witnesses testifying long after the event, and this does not rise to the dignity of proof requisite to establish prior use. Barbed Wire Patent Case, 143 U. S. 275; Eibel Process Case, 261 U. S. 45.

Jardine, upon an application filed March 11, 1920, claimed an invention of which the chief object was construction of a light alloy piston which would operate satisfactorily at all temperatures and lend itself to economic methods of manufacture. He cut away all the skirt portions at the webs, extending the latter to nearly the length of the skirt parts or slippers. Horizontal slots partially insulated the slippers from the head and these were split vertically to render them yieldable to contact with the cylinder wall. The head was integrally connected to the skirt only in the region above the bosses. His thought was that since heat expansion tends to increase the diameter of the piston in a direction parallel with the wrist pin bosses, when the skirt around the bosses is removed, the central part of the web is free to move while its ends are restrained and resisted by the skirt, faces in contact with the cylinder wall. There is insistent challenge and an insistent defense of the validity of Jardine. [fol. 2391] On the one hand it is urged that Jardine is but the slipper structure of Ricardo patent No. 1,294,833, and that it involved no invention to merely slit vertically its skirt parts as disclosed by Gulick and others. The response

is that Jardine discloses a combination of inter-related operating parts that goes far beyond Ricardo, is economical to construct and carries the Gulick concept an important step forward. Jardine indicates the forces, thermal and mechanical, which bear upon the flexible web to compensate for heat expansion of the cylinder head, pointing to the web as being in effect a cantilever structure, weakest at its supports. Jardine came to the attention of the Aluminum Company and the Maxwell at a time when Ricardo and other English engineers were trying to modify the Ricardo piston to meet the piston problem. It was thought to give great promise. Tests had been made and commercial manufacture planned when the Maynard piston was presented to them. It appeared so much better that the construction illustrated and described by him was adopted. Since it is the Maynard specific form embodying the basic concept of Gulick that made commercial piston history, since Jardine was without substantial commercial recognition and none of the accused devices are slipper pistons, since whatever Jardine contributed to the art, if anything, is said to be incorporated in Maynard and since the really important infringement is said to be the copying by the defendants of the commercial embodiment of Maynard, we feel under no necessity at this time of ruling upon the validity of the Jardine patent or the fact of its infringement.

Maynard upon a patent application filed January 3, 1931, embodies the Gulick combination of skirt insulation, skirt flexibility by means of vertical slotting cooperating with longitudinal slotting, and flexible webs in the region of the wrist pine bosses. He also follows Jardine's simplified design to permit economical manufacture and Jardine's boss relief. The Maynard piston, however, is not a slipper piston. While Jardine carried the webs nearly to the bottom of the skirt and omitted all of the skirt on the web faces, Maynard provided webs about two-thirds of the length of the skirt and continued the latter circumferentially below the webs except for a single vertical slot throughout one bearing face of the skirt. This structure increased the effect of heat on retarding the expansion of the piston so as to permit of a narrowed web. The upper part of the skirt, which reaches higher temperature, is provided with greater compensation against heat expansion [fol. 2392] by having its periphery interrupted by relief

about the bosses. The lower part of the skirt requires no interruption of its periphery other than the vertical slot because it receives less heat. This results in a better bearing surface and means additional to the piston rings for closing the passage between the piston and the cylinder wall. It is clear that Maynard, while not departing from the teaching of Gulick in basic combination of elements, discloses a piston lighter and more economical of manufacture than Gulick and one more rugged and durable than Jardine. That the Maynard piston had a very great effect upon the industry and substantially advanced the art, there can be no doubt upon this record. In the precise form disclosed by Maynard and depicted in his drawings, many thousands were made and successfully used. In a somewhat modified form its production and use has run into very many millions.

Little is claimed for Moores and Schmiedeknecht, and while some of the claims of each may possibly read on some of the accused structures, they have apparently no commercial history and have not substantially advanced the art. We do not pass upon them, and apprehend that the real controversy here is in respect to validity and infringement of Gulick and Maynard.

Of the devices charged to infringe, the one of prime importance to the plaintiff is undoubtedly the Sterling piston, exemplified by Exhibit 1. The defendants seek to avoid infringement by this structure, which with slight modification, follows the drawings and description of the Maynard patent, and without change, the commercial structure of the plaintiff's licensee, by the contention that its webs are rigid at the top and thus it is distinguished from Maynard, compensation for rigidity being achieved by reducing the thrust faces of the piston skirt at an angle to the vertical sides of the web, giving to the relief in the region of the bosses the so-called "keystone" configuration. But there are no limitations in the claims in suit as to the region of flexibility in the webs, and if the keystone relief provides greater flexibility at the union of the webs with the skirt, it is but a difference in degree, and not one of mode of operation or result and will not avoid infringement. In comparing commercial embodiments of invention with the drawings of patents it is not unusual to find that without departing from the teachings of the inventor improved

operation may result from some modification of the disclosure. This court has indicated, Gordon Form Lathe Co. v. Walcott Machine Co., 32 Fed. (2d) 55, 61, that superiority of operation, even when brought about by a valuable [fol. 2393] improvement which perhaps was patentable as such, will not of necessity negative infringement, citing Schiedel Toy, etc., Co. v. Clark, 217 Fed. 760, 771, Toledo Machine & Tool Co. v. E. W. Bliss Co., 287 Fed. 443, 447. The Gordon and Redlin patent there considered was in a true sense a pioneer patent and entitled to broad equivalents, but this does not mean that meritorious inventions which substantially advance the art are entitled to no reasonable range of equivalency. As was said in Eibel Process case, supra, at 63: "Eibel made a very useful discovery which has substantially advanced the art. His was not a pioneer patent creating a new art; but a patent which is only an improvement on an old machine may be very meritorious and entitled to liberal treatment. Indeed, when one notes the crude working of machines of famous pioneer inventions and discoveries, and compares them with the modern machines and processes exemplifying the principle of the pioneer discovery, one hesitates in the division of credit between the original inventor and the improver; and certainly finds no reason to withhold from the really meritorious improver, the application of the rule 'Ut res magis valeat quam pereat' which has been sustained in so many cases in this court." A careful consideration of the patents to Gulick and Maynard, an analysis of the claims of each in suit, and a review of the evidence as to principles and modes of operation, lead us inevitably to the conclusion that the Sterling piston (Exhibit 1) infringes the claims in suit of both, and that such minor differences as appear in the commercial embodiment of Maynard, with which Exhibit 1 is identical, do not fall without the reasonable range of equivalents to which the inventors' contribution to the advancement of the art entitle them.

In the remaining accused devices we find no infringement. True, there is similarity. Here and there are identical elements, singly and in combination, but the complete combination upon the conception of which we found Gulick and Maynard to denote invention, does not in any others appear, and so it must be said here as in Gear Grinding Machine Co. v. Studebaker Corporation, supra, in reference

to such situation: "It is the patentee's necessary dependence upon the co-operation of all the elements in one machine in order to make the claims valid that also makes this achievement possible."

We find claims 1, 11, 12, 13, 15, 18, 30, 33 of Gulick and Maynard patent in respect to all of the claims sued upon valid. We find such claims to be infringed by the Sterling piston exemplified by Exhibit 1. The decrees below are set aside and the causes remanded for the entry of decrees [fol. 2394] granting the usual relief of injunction and accounting in respect to such infringement as has been found and dismissing the bills with respect to the alleged infringements of Jardine, Moores and Schmiedeknecht, without prejudice. Costs of appeal will be borne by the defendants.

[fol. 2395] UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT

I, J. W. Menzies, Clerk of the United States Circuit Court of Appeals for the Sixth Circuit, do hereby certify that the foregoing is a true and correct copy of record and proceedings in the cases of The Cleveland Trust Company and Chrysler Corporation vs. The Schriber-Schroth Company, The Aberdeen Motor Supply Company, The F. E. Rowe Sales Company, No. 7223-4-5, as the same remains upon the files and records of said United States Circuit Court of Appeals for the Sixth Circuit, and of the whole thereof.

In testimony whereof, I have hereunto subscribed my name and affixed the seal of said Court at the City of Cincinnati, Ohio, this 30th day of December, A. D. 1937.

J. W. Menzies, Clerk of the United States Circuit Court of Appeals for the Sixth Circuit. (Seal.)

[fol. 2396] SUPREME COURT OF THE UNITED STATES

No. 3

October Term, 1938

ORDER ALLOWING CERTIORARI—Filed May 31, 1939

The petition herein for a writ of certiorari to the United States Circuit Court of Appeals for the Sixth Circuit is granted. And it is further ordered that the duly certified copy of the transcript of the proceedings below which accompanied the petition shall be treated as filing in response to said writ.

[fol. 2397] SUPREME COURT OF THE UNITED STATES

No. 4

October Term, 1938

ORDER ALLOWING CERTIORARI—Filed May 31, 1939

The petition herein for a writ of certiorari to the United States Circuit Court of Appeals for the Sixth Circuit is granted. And it is further ordered that the duly certified copy of the transcript of the proceedings below which accompanied the petition shall be treated as filing in response to said writ.

[fol. 2398] SUPREME COURT OF THE UNITED STATES

No. 5

October Term, 1938

ORDER ALLOWING CERTIORARI—Filed May 31, 1939

The petition herein for a writ of certiorari to the United States Circuit Court of Appeals for the Sixth Circuit is granted. And it is further ordered that the duly certified copy of the transcript of the proceedings below which accompanied the petition shall be treated as filing in response to said writ.

Supreme Court of the United States

I, Charles Elmore Cropley, Clerk of the Supreme Court of the United States, do hereby certify that the foregoing Volumes I, II, III, IV and V, pages, numbered from - - 1 - to - - - - - 2,396 - - - - - - , inclusive, contain a true copy of the Record as printed for use in this Court - - - - - -

States, do hereby certify that the foregoing volume

pages, numbered from - - 1 - to - - - - - 2,396 - - - - - - - , inclusive,

contain a true copy of the Record as printed for use in this Court

- in the case of

THE SCHRIBER-SCHROTH COMPANY, Petitioner;
THE ABERDEEN MOTOR SUPPLY COMPANY, Petitioner; and
THE F. E. ROWE SALES COMPANY, Petitioner,
vs.
THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

Nos. 3, 4, and 5, , October Term, 1938 , as the same remains upon the

files ~~and records~~ of said Supreme Court.

In testimony whereof I hereunto subscribe my name and affix the seal of said Supreme Court, at the City of Washington, this - - fourteenth - - - day of - - March - - - - -, A. D. 1939.

Charles Edmund Cropley

Clerk of the Supreme Court of the United States.

FILE COPY

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FILED
JAN 7 1938
CHARLES ELMORE CROPLEY
CLERK

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1937

No. [redacted] 3

THE SCHRIBER-SCHROTH COMPANY,
Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION,
Respondents.

No. [redacted] 4

THE ABERDEEN MOTOR SUPPLY COMPANY,
Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION,
Respondents.

No. [redacted] 5

THE F. E. ROWE SALES COMPANY,
Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION,
Respondents.

PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT.

THOMAS G. HAIGHT,
GEORGE L. WILKINSON,
JOHN H. BRUNINGA,
JOHN H. SUTHERLAND,
Attorneys for Petitioners.

January 7, 1938.

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SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1937

No.

THE SCHRIBER-SCHROTH COMPANY,
Petitioner.

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION,
Respondents.

No.

THE ABERDEEN MOTOR SUPPLY COMPANY,
Petitioner.

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION,
Respondents.

No.

THE F. E. ROWE SALES COMPANY,
Petitioner.

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION,
Respondents.

PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT.

To the Honorable the Chief Justice of the United States, and the Associate Justices of the Supreme Court of the United States:

Your petitioners, The Schriber-Schroth Company, The Aberdeen Motor Supply Company, and The F. E. Rowe

Sales Company, respectfully pray for writs of certiorari to the Circuit Court of Appeals for the Sixth Circuit to review the judgments of that court entered on October 8, 1937.

Summary and Short Statement.

Petitioners were defendants in the District Court, where they prevailed. The Circuit Court of Appeals for the Sixth Circuit reversed the District Court, in part.

Respondent, The Cleveland Trust Company,* is a banking corporation holding title (under a Trust Agreement, R. p. 1345) to a pool of eighty odd patents (R. p. 2241). The patents included in the pool were assigned to Respondent by the Packard Motor Company (R. p. 1321), Aluminum Company of America (R. p. 1322), and others. All of the patents in the pool relate to pistons for internal combustion engines, of the type employed in automobiles.

Licenses under the pool of patents are held solely by The Aluminum Company of America (R. p. 1382), Bohn Aluminum & Brass Corporation (R. p. 1415), and Aluminum Industries, Inc. All have agreed (R. p. 182) to pool all patents relating to pistons per se, now owned or hereafter acquired by them. All own shares of beneficial interest in the pool (R. p. 271), The Aluminum Company of America and the Bohn Company in their own names, and the Aluminum Industries through its officer and principal, H. J. Hater. All pay royalties to the pool on all aluminum pistons made by them and the proceeds are thereafter paid back to the beneficiaries.

Respondent brought three separate suits against the respective Petitioners (three Cleveland dealers in pistons made by Sterling Products Corporation of St. Louis, Missouri), alleging infringement of five different patents. The three cases all involve the same issues (including the same

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*Herein referred to as "Respondent", Chrysler Corporation having been but a nominal and unwilling party plaintiff below.

accused device) and for convenience were consolidated below, likewise here. Respondent caused these cases to be referred to a Special Master for trial upon the merits. The Master heard the testimony of witnesses, observed tests and considered the evidence which was introduced by the parties. He found (R. p. 1106-9) all five patents invalid, and further found that the patents, if valid, were not infringed by any of the several accused devices. Respondent filed many exceptions to the report of the Special Master, but the District Court (R. p. 1229) overruled all of the exceptions and entered a decree (R. p. 1230) adopting the Master's Findings of Fact and Conclusions of Law as its own.

Respondent appealed to the Court of Appeals for the Sixth Circuit, with the result that two of the patents [Gulick No. 1,815,733 (R. p. 1293) and Maynard No. 1,655,968 (R. p. 1299)] were held to be valid (R. p. 2395), and to have been infringed by one accused device (Exhibit 1). The Court of Appeals apparently regarded the patents as pertaining particularly to pistons made of *aluminum*, although neither the Gulick nor the Maynard patent makes any reference whatever to aluminum. The Court of Appeals also regarded the patents as pertaining to pistons of the "flexible web" type, although there was no reference to this essential feature in the application for either of them, *as filed*.

The application for Gulick patent was filed in November, 1917, but the patent did not issue until 1931. *As filed* in 1917, it described the piston as "extremely rigid." (R. p. 1839.) Between 1917 and 1922 it became evident* that pistons of the "flexible web" type would become popular. In 1922 there

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*This was largely attributable to the efforts of one Long, who, as found by the Master (R. p. 1103) had produced such a piston as early as March, 1916, had it on the market from 1917 to 1926 and had it adopted by the Franklin Automobile Company in 1920. The Long piston was described by an engineer of Packard Motor Company in a publication in January, 1920, and was being advertised to the trade in 1921. In 1926, after Respondent had sued him, Long discontinued his piston business.

were pending in the Patent Office several applications disclosing the "flexible web" type of piston. An interference was declared between a Hartog application and a Pomeroy application, the latter owned by Aluminum Company of America. This terminated adversely to Aluminum Company of America on August 10, 1922 (R. p. 2279). Immediately thereafter steps were taken by Packard Motor Company and Respondent, probably with the aid and assistance of Aluminum Company of America, to monopolize the aluminum piston field. On September 11, 1922, Packard Motor Company assigned the Gulick application to the pool (R. p. 1321), and on the next day the Gulick application was amended by changing the description from "extremely rigid" to "longitudinally rigid" and, for the first time, *adding* a suggestion that—

> "the web structure has sufficient *lateral flexibility* to permit the split to close more or less under the action of the expanding forces incident to the heating of the piston" (R. p. 1867).

In that amendment, the claim which had been involved in the Hartog-Pomeroy interference, identified as such, was inserted in the Gulick application (R. p. 1872), with a statement that

> "This interference has recently been brought to applicant's attention" (R. p. 1875).

Thereupon interferences were declared in the Patent Office between the Gulick application and the applications of Hartog, Long and others. Hartog and Long immediately questioned the right of Gulick to make the radical amendment. On April 4, 1924, a tribunal of the Patent Office (R. pp. 1548-50) sustained* Gulick's right to make the amendment, and immediately thereafter the pool matured into its full potence.

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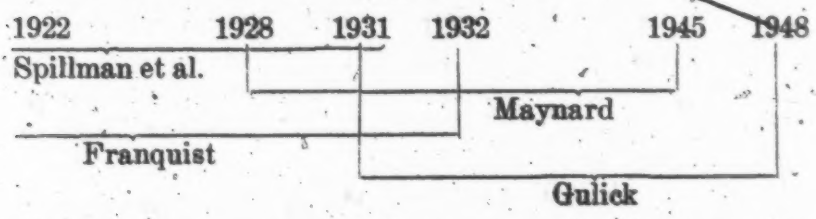
*Subsequently affirmed by the Court of Appeals, D. C., 17 F. (2d) 686, and followed by the Court of Customs and Patent Appeals, 47 F. (2d) 365, 366, 367.

Pistons of the type shown in the Maynard patent appeared about 1922 (R. p. 69). In 1924 the important piston manufacturers in this country pooled their interests with the obvious intention to extend the monopoly on that particular piston. This was done by bringing the then diversely owned Spillman & Mooers patent, No. 1,092,870, and Franquist patent No. 1,153,902, together with the then pending Gulick application, into the pool. Subsequently Respondent acquired a one-half interest in the Maynard patent, No. 1,655,968. The decision of the Circuit Court of Appeals in this case effectually extended that monopoly to 1948. It was done as shown in the following diagram:



Before they expired, Respondent represented that the pioneer Spillman & Mooers and Franquist patents were responsible for the success of the aluminum piston (R. p. 1120-1123). Licenses were issued (R. p. 1381, 1408, 1414), royalties collected (R. p. 102), suits brought (R. p. 101, 109), judgments recovered (R. p. 1341), relying upon those patents as dominating flexible aluminum pistons, and they were generally acquiesced in. But upon the trial of these cases, *after those patents had expired*, they were renounced by Respondent and *denounced* (R. pp. 99-100, 107, 109, 177, 247) by Respondent's expert as inflexible and unsuited for aluminum construction.

The Decisions of the Master and the District Court.

The Master held the Gulick patent invalid *in toto* because of the attempt to broaden the original application as against

intervening rights (Fact finding 15, R. p. 1107), relying upon this Court's decision in *Powers-Kennedy Corporation* v. *Concrete M. & C. Co.*, 282 U. S. 175 (R. p. 1156). The Master and the District Court took due notice (R. pp. 1150, 1229) of the fact that the Patent Office tribunals, as well as the Court of Appeals for the District of Columbia and the Court of Customs and Patent Appeals, had held that Gulick was within his rights in making the beforementioned radical change in his application. The Master explained his refusal to follow those decisions on the ground that this Court's subsequent decision in *Permutit* v. *Graver*, 284 U. S. 52, had removed the legal basis for them; furthermore, the factual basis upon which those previous decisions had been predicated was, in this case, admitted* by Respondent's expert witness to have been erroneous. The Master held in effect that this overcame the presumption of validity to which the Gulick patent was normally entitled. The District Court was urged, but declined, to overturn the Master's Report upon the basis of this Court's, then recent, decision in *Radio Corporation of America* v. *Radio Laboratories*, 293 U. S. 1.

The Decision of the Court of Appeals:

The Circuit Court of Appeals followed the decisions of the Patent Office Tribunals and the administrative courts, without regard to the two very cogent reasons assigned by the Master for his refusal so to do. The Circuit Court of Appeals was erroneously led to follow those decisions by what it understood to be the admonition of this Court in *Radio Corporation of America* v. *Radio Laboratories, supra*, where this Court said that a patent which issued pursuant to pro-

*That inherent flexibility could not be relied on (R. p. 229). That "extremely rigid" was incompatible with flexibility (R. pp. 149-150). That webs can be made non-flexing (R. p. 154). That it was necessary to deliberately design the webs to secure flexibility (R. p. 156, 229).

tracted contest in the Patent Office was endowed with a presumption of validity "not to be overthrown except by clear and cogent evidence" (293 U. S. 2). The Circuit Court of Appeals did not, as the Master and the District Court had done, regard the abolition (by *Permutit* v. *Graver*, 284 U. S. 52) of the legal basis for the administrative decisions, or the admission (abovementioned) in this record, of the incorrectness of the factual basis therefor as sufficient to overcome the strong presumption of validity.

It is clear from a reading of the decision of the Court of Appeals that the Court was moved to hold the Gulick and Maynard patents valid because of assumed "commercial success." The only evidence adduced to prove this was evidence of the payment of royalties under the *eighty* patents in the pool. That was not contradicted, but by cross-examination of Respondent's witnesses it was shown that the success of the aluminum piston was ascribable to other things.* From that evidence the Circuit Court of Appeals inferred (R. p. 2387) that the Gulick and Maynard patents had made the aluminum piston a success.**

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*In other litigation Respondent's expert had testified that the inventions of other patents made the aluminum piston a success (R. p. 91). Respondent had represented the now expired Spillman *et al.* and Franquist patents as being responsible for the commercial success of aluminum pistons in other litigation, had obtained judgments restraining infringements and had collected royalties upon them (R. p. 1122, 1184). That from seven to ten million aluminum pistons had been made before the advent of the Gulick and Maynard patents (R. p. 92).

**The Master stated in his Report (R. pp. 1182-3):

"The situation here is peculiar, for the structures of none of the pistons (patents) in suit have ever gone into commercial use. That of Schmiedeknecht, Mooers, Gulick and Jardine not at all, while as to the Maynard design, the proof is that it was not used successfully until it had been provided with the Keystone relief. Particularly as to the Maynard piston it was discarded by Chrysler, an unwilling party plaintiff which has the right to its use as a half-owner of the patent."

"The plan of plaintiff and its licensees has been to control the market in the manufacture of aluminum pistons, and former competitors Bohn Aluminum & Brass and Kant-Skore became sub and collateral licensees."

The Court of Appeals in describing (R. p. 2386) the combination contemplated by the Gulick patent, which it held patentable, included "webs laterally flexible"; and likewise, in describing (R. p. 2392) the combination of the Maynard patent, which it held patentable, the Court of Appeals included "flexible webs." *The Maynard patent does not state whether the webs are flexible or rigid.* The Gulick patent, as *issued*, says that the webs are flexible, but the application therefor, as *filed*, described the structure as "extremely rigid."

The Circuit Court of Appeals, therefore, as to each patent, found the patentable combination to include an *element not described* in the patent applications, *as filed*.

Reasons Relied Upon For the Allowance of the Writ.

Petitioners believe that writ of certiorari should be granted in these cases for the following reasons:

I.

That the Circuit Court of Appeals for the Sixth Circuit misinterpreted or unduly limited this Court's decision in *Permutit* v. *Graver*, 284 U. S. 52, by refusing to hold a patent invalid where a feature found to be an essential element of the patented combination was not described in the application for patent *as filed*.

The combination found patentable by the Court of Appeals included "flexible webs." The Gulick application was amended five years after it was filed, to describe the essential element (flexible webs), and issued as thus amended. The Maynard patent does not now and never did contain a description of the flexible web. The patent drawing is the only basis for the decision of the Circuit Court of Appeals that the web of either was flexible, but Respondents' own witness said inherent flexibility was not enough. The decision as to the Maynard patent is, therefore, directly in conflict with

this Court's decision in *Permutit* v. *Graver, supra.* The decision as to the Gulick patent raises the *novel question* whether, under the decisions in *Permutit* v. *Graver, supra,* and *Powers-Kennedy Corporation* v. *Concrete M. & C. Co.,* 282 U. S. 175, 185, it is permissible to so amend a patent application as to antithetically change the described characteristics of an essential element on the basis of alleged inherence* in the structure shown by a drawing, especially when the amendment is made more than two years after the original application was filed, during which time adverse rights had arisen. This question is important and should, it is submitted, be settled by this Court.

The Circuit Court for the Sixth Circuit has showed its disposition to limit the doctrine of this Court's decision in *Permutit* v. *Graver, supra,* not only by refusing to apply it in this case, but by expressly limiting it, as in *Chicago Forging & Manufacturing Company* v. *Bade Cummins Manufacturing Company,* 63 F. (2d) 928, l. c. 929-930 and *Wadsworth* v. *Westinghouse,* 71 F. (2d) 850, l. c. 852. On the other hand, the courts in the other circuits have applied *Permutit* v. *Graver* to a fuller extent. [*Standard Oil Company* v. *Globe Oil and Refining Company,* 82 F (2d) 488, C. C. A. 7; *Kessler* v. *Buick Motor Company,* 64 F. (2d) 599, C. C. A. 5; *Zenitherm Co.* v. *Art Marble Co.,* 56 F. (2d) 39, C. C. A. 5; *Schindler & Co.* v. *Saladino & Sons, Inc.,* 81 F. (2d) 649, C. C. R. 1; *Anchor Cap & Closure Corp.* v. *Linhardt,* 56 F. (2d) 542, C. C. A. 8; *Helfrich* v. *Solo,* 59 F. (2d) 525, C. C. A. 7.]

II.

The Court of Appeals misinterpreted or unduly limited the doctrine of *Adamson* v. *Gilliland,* 242 U. S. 350.

The Circuit Court of Appeals held (R. p. 2387), that the aluminum piston problem was not solved until the alleged

*Contrary to the original description.

inventions of the Gulick and Maynard patents, *only* upon evidence as to the payment of royalties under *eighty pooled patents*, although it was developed on the cross-examination of respondents' witness that the success of the aluminum piston was ascribable to *other things* than the alleged Gulick and Maynard inventions. In so doing, it overruled the Master who had heard and seen the witnesses. Although there was no conflict of testimony on this point, there was evidence consistent with the Master's finding. In *Adamson v. Gilliland*, 242 U. S. 350, at 353, this Court said:

> "so far as the finding of the master or judge who saw the witnesses 'depends upon conflicting testimony or upon the credibility of witnesses, or so far as there is any testimony consistent with the finding, it must be treated as unassailable'."

An important question is thus presented whether, under the doctrine laid down in *Adamson* v. *Gilliland*, an appellate court may overrule the finding of the trial judge who has heard and seen the witnesses, where there is no conflict in their testimony, where such testimony is consistent with the trial judge's finding of fact, and where such finding is not clearly wrong.

The doctrine of *Adamson* v. *Gilliland* is one which is frequently relied upon in patent cases. The courts of the various circuits do not apply it uniformly. Some of the Courts of Appeal have come to substantially disregard the doctrine of that case, but other Courts of Appeal, as for instance in the 9th * and 10th ** Circuits, follow it scrupulously. The importance of clarifying the doctrine of *Adamson* v. *Gilliland* is emphasized by the fact that a number of

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*Stoody Co. v. Mills Alloys, Inc., et al, 67 Fed. (2d) 807.

**Freiberg v. Pierce, 83 Fed. (2d) 961; Independent Oil Well Cementing Co. et al. v. Halliburton et al., 54 Fed. (2d) 900.

times * during the last two and current terms of this Court, petitions for writ of certiorari based upon that case have been filed.

III.

The Circuit Court of Appeals for the Sixth Circuit misinterpreted or unduly extended the doctrine of this Court's decision in *Radio Corporation* v. *Radio Laboratories*, 293 U. S. 1, by refusing to hold that the "clear and cogent evidence", stated to be necessary to overcome the presumption of validity of a patent which had been issued after a contest, was not presented, when it was made to appear (as the Master in the District Court found that it had been) that the *legal basis* for the decisions of the Patent Office and administrative tribunals was shown to be wrong by this Court's subsequent decision in *Permutit* v. *Graver;* and when it was made to appear by testimony of Respondents' own witness that the *factual basis* for the administrative decision, inherent flexibility of webs in the piston shown in the patent drawing, was insufficient.

The Master and the District Court refused to follow the decisions of the administrative tribunals approving the radical amendments made in the Gulick application because this Court's decision in *Permutit* v. *Graver* overcame the legal basis upon which those decisions were predicated. Furthermore, by the testimony of Respondents' own witness in this case, the factual basis upon which the administrative decisions were predicated was overcome. The Court of Appeals, nevertheless, considered the Gulick patent's presumption of validity as unmitigated.

Lever Bros. Co. v. *Colgate Palmolive-Peet et al.*, No. 343 (1937); *D. & M. Machine Works* v. *Texas Rubber & Specialty Co. et al.*, No. 1083 (1936); *Rubin Condenser Co. et al* v. *Copeland Refrigeration Corp.*, No. 653 (1936); *The Maytag Co.* v. *Brooklyn Edison Co., Inc.*, No. 654 (1936); *C. M. Kemp Mfg. Co.* v. *Wm. F. Hoelke*, No. 901 (1935); *Rubin Condenser Co. et al* v. *Aerovox Corp.*, No. 421 (1935).

An important question thus presented is whether a patent's presumption of validity shall prevail where it is shown that the patent issued pursuant to an interpretation of R. S. 4888, subsequently held to be wrong by this Court.

Public Importance.

The pooling of patents has become a prevalent practice. Holding many patents, such a pool may say, as the pool here did, during the life of a given patent that commercial success is attributable to that patent, but after the given patent has *expired*, such a pool may, as was done in this case, attribute commercial success to a different (yet unexpired) patent. This process may be repeated indefinitely. Thus, while commercial success may be a fair symptom of invention in the usual case, the proof of such success in the case of a *pooled* patent should be beyond a reasonable doubt. Improvement will be discouraged and the public will be penalized unless the pooling of patents, and the law with reference to commercial success is limited so as to prevent a patent pool from *misappropriating* to a junior patent, the acclaim, rightly belonging to a senior patent, *after the senior patent has expired.*

The decision of the Circuit Court of Appeals in this case condones not only the pooling of patents, but the practice of radically changing the description in an application for patent so as to cover devices which have appeared on the market since the filing of the application. The situation in this case is even more aggravated than was the situation in the case of *Powers Kennedy Corporation* v. *Concrete Mixing & Conveying Company*, 282 U. S. 175, when this Court said:

> "When this application came into interference with McMichael's, he, of course, became familiar with Leake's claims. It is significant that he then amended his claims, almost in the very words of Leake. This of

itself destroys the patent. Railway Co. *v.* Sayles, 97 U. S. 554; General Electric Co. *v.* Sangamo Electric Co., 174 Fed. 246; Lopulco Systems, Inc. *v.* Bonnot Co., 24 F. (2d) 510."

Plainly that doctrine is not limited to an interference situation, but should be regarded as a general pronouncement against radical amendments to patent applications after adverse rights have arisen and without respect to how they arose. Otherwise the tendency will be to retard, rather than "to promote the progress of science and the useful arts."* Industry will fear improvement; patent application maneuvering will have become an instrumentality of blackmail.

The record in this case shows that Respondent has brought at least seven suits against alleged infringers within the Sixth Circuit. The pistons involved in this case are largely used in automobiles. This Court can take judicial notice of the fact that substantially all of the automobiles manufactured in the United States are manufactured within the Sixth Circuit. The Respondent declined an invitation (R. p. 22), to bring suit against Sterling Products Corporation, manufacturer of the piston accused here, in its home jurisdiction, the Eighth Circuit. As long as the decision of the Court of Appeals for the Sixth Circuit stands in this case, Respondent will have practically as much relief as it could have by bringing suits against lesser infringers in other circuits, and it is consequently doubtful that Respondent will permit another Circuit Court of Appeals to adjudicate the patents here in suit. Hence it is doubtful that this case could ever reach this Court on the basis of conflicting decisions between different Circuit Courts of Appeals. In the meantime, a large percentage of automo-

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*Constitution Art. I, Sec. 8, Sub. paragraph 8.

bile owners in this country will pay tribute to Respondents' patent pool.

Similar circumtsances were pointed out in petitions for rehearing, which resulted in the grant of the writs, in *Paramount Publix Corp.* v. *American Tri-Ergon Corp.*, 294 U. S. 464, and *Altoona Publix Theatres, Inc.* v. *American Tri-Ergon Corp.*, 294 U. S. 477.

Prayer.

Wherefore, your Petitioners respectfully pray that writs of certiorari be issued to the Circuit Court of Appeals for the Sixth Circuit to the end that these causes may be reviewed and determined by this Court; that the decrees of the Circuit Court of Appeals for the Sixth Circuit be reversed; and that Petitioners be granted such other and further relief as may be proper.

THE SCHREIBER-SCHROTH COMPANY,
THE ABERDEEN MOTOR SUPPLY COMPANY,
THE F. E. ROWE SALES COMPANY.

By THOMAS G. HAIGHT,
GEORGE L. WILKINSON,
JOHN H. BRUNINGA,
JOHN H. SUTHERLAND,
Attorneys for Petitioners.

BRIEF IN SUPPORT OF PETITION FOR WRIT OF CERTIORARI.

Opinions of Courts Below.

The Report of the Special Master before whom the case was tried on its merits is found in pages 1092 to 1189 of the Record. The Memorandum Opinion of the District Court overruling Respondents' exceptions to the Report of the Special Master and adopting the Special Master's Findings of Fact and Conclusions of Law as those of the court is found at Record page 1229 and the Decree entered pursuant thereto at Record page 1230.

The Opinion of the Circuit Court of Appeals (Circuit Judges Hicks, Simons and Allen, Judge Simons writing) is reported at 92 F. (2d), page 330 and appears at pages 2381 to 2395 of the record.

Jurisdiction.

The judgment of the Circuit Court of Appeals was entered October 8, 1937 (R. pp. 2379-80).

The statute giving jurisdiction is Section 240-A of the Judicial Code (28 U. S. Code, Sec. 347).

Statement of the Case.

The foregoing Petition contains a summary of the material facts necessary to an understanding of the reasons relied upon for the allowance of the writ as well as a statement of questions involved in the case.

Specification of Errors.

1. That the Circuit Court of Appeals for the Sixth Circuit erred in finding, and holding patentable, a combination including one element not described in the original applications for the Gulick and Maynard patents in suit, and in

refusing to follow this Court's decisions in *Permutit* v. *Graver*, 284 U. S. 52, and *Powers-Kennedy Corp.* v. *Concrete M. & C. Co.*, 282 U. S. 175, as interpreted by other Circuit Courts of Appeal.

2. That the Circuit Court of Appeals erred in accepting proof of payment of royalties under a pool of eighty patents, as proof of "commercial success" of the Maynard and Gulick patents, and in rejecting the contrary finding of the Master who heard and saw the witnesses.

3. That the Circuit Court of Appeals erred in holding that the presumption of validity of a patent, however strong, is not overcome when it is shown that the legal basis for an administrative adjudication leading to its issuance had been declared wrong by a subsequent decision of this Court; or when it is admitted that the factual basis for that adjudication was wrong.

4. That the Circuit Court of Appeals erred in reversing and in not affirming the judgment of the District Court holding the patents in suit invalid and, even if valid, not infringed; and in awarding costs to plaintiff-respondent.

ARGUMENT.

I.

The Circuit Court of Appeals, by Refusing to Apply the Doctrine of Permutit v. Graver, 284 U. S. 52 Tacitly Restricted that Doctrine.

R. S. 4888 (35 U. S. Code 33), requires an applicant for patent to file in the Patent Office a written description of his invention

> "in such full, clear, concise and exact terms as to enable any person skilled in the art or science to which it appertains or with which it is most nearly connected to make, construct, compound and use the same"

and to

> "explain the principle thereof and the best mode in which he has contemplated applying that principle"

as well as to

> "particularly point out and distinctly claim the * * * combination which he claims as his invention or discovery."

In *Permutit* v. *Graver*, 284 U. S. 52, this Court interpreted that section of the statutes and held that drawings alone, absent description of the one feature, seriously urged as the essential and characterizing feature, was not a compliance with the statute. In that case this Court further held, l.c. 60:

> "The statute requires the patentee not only to explain the principle of his apparatus and to describe it in such terms that any person skilled in the art to which it appertains may construct and use it after the expiration of the patent, but also to inform the public during the life of the patent of the limits of the monopoly asserted, so that it may be known which features may be safely used or manufactured without a license and which may not."

Since this Court's decision in *Permutit* v. *Graver* the Courts of Appeal in the First, Fifth, Seventh and Eighth Circuits have held patents invalid where they did not *describe the element relied upon* by the patentee as being the essential and characterizing one. This was done by the courts in *Zenitherm Co.* v. *Art Marble Co.*, 56 F. (2d) 39, (C. C. A. 5); *Schindler & Co.* v. *Saladino & Sons, Inc.*, 81 F. (2d) 649 (C. C. A. 1); *Helfrich* v. *Solo*, 59 F. (2d) 525 (C. C. A., 7); *Anchor Cap & Closure Corp.* v. *Linhardt*, 56 F. (2d) 542 (C. C. A. 8). In this case, for the first time since the decision of this Court in *Permutit* v. *Graver*,

supra, a Court of Appeals has held a patent valid and infringed where the novelty upon which the patentee relies was *not described* in the application for the patent *as filed.* Obviously the Court of Appeals in this case did not interpret *Permutit* v. *Graver* as the Seventh Circuit Court of Appeals did in *Helfrich* v. *Solo,* 59 F. (2d) 525 (C. C. A. 7), where that Court says:

> "Appellant has failed to disclose in his specification or claims the novelty upon which he now relies, and this we think precludes his recovery on any of his claims. Permutit Co. *v.* Graver Corporation, 284 U. S. 52, 52 S. Ct. 53, 76 L. Ed. 163; White *v.* Dunbar, 119 U. S. 47, 7 S. Ct. 72, 30 L. Ed. 303; Brown *v.* Stilwell & Bierce Mfg. Co. (C. C. A.) 57 F. 731."

In the present case the Court of Appeals described the combination of elements which it found to be patentably valid in the Gulick patent as follows (R. p. 2386):

> "But to combine insulation of head from skirt, retraction of the bosses from the skirt periphery, connection of such bosses to the skirt with *webs laterally flexible* and yet so carried from the head as to support the load upon the wrist pin with sufficient strength and rigidity, and to utilize the mechanical force of the cylinder wall upon the skirt and the thermal expansion of the bosses so as to compensate evenly and fully for head expansion and to secure a balanced flexibility of the skirt with no bending concentration at any point therein, discloses, we think, a meritorious concept beyond the reach of those skilled in the art."

As pointed out in the Petition, the Gulick application *as* originally *filed* contained no reference to flexible webs. On the contrary, the Gulick structure was originally described as an "*extremely rigid*" one. *Five years* after the filing of the application, the description was changed from "rigid" to "*flexible,*" upon the representation of Respon-

dent, assumed to be correct by the Patent Office and the administrative courts, that flexibility was inherent in the structure shown in the Gulick drawings. In this case Respondent's expert, however, admitted that flexibility was not inherent in the web structure, but that a piston had to be especially designed in order to accomplish flexibility. While, at the time the question was presented to the tribunals of the Patent Office and the administrative courts, it was the practice of the Patent Office to permit amendments describing a supposed "inherent" mode of operation or characteristic of a structure shown only in the *drawings* of a patent application, that practice was unqualifiedly overthrown by this Court's decision in *Permutit* v. *Graver, supra.*

Notwithstanding these facts, the Court of Appeals for the Sixth Circuit, pursuant to its disposition to restrict the doctrine of *Permutit* v. *Graver,* followed the decisions of the Court of Appeals of the District of Columbia, 17 F. (2d) 686, and the Court of Customs and Patent Appeals, 47 F. (2d) 365, 366, 367, without explaining in what respect, the contrary decision of the Master and the District Court was found to be in error.

Similarly, the Court of Appeals, in describing the Maynard patent combination which it found to be patentably valid, said (R. p. 2392):

> "Maynard * * * embodies the Gulick combination of skirt insulation, skirt flexibility by means of vertical slotting cooperating with longitudinal slotting, and *flexible webs* in the region of the wrist pin bosses."

As pointed out in the Petition, there is not in the Maynard patent nor was there ever in the application for the Maynard patent, a suggestion that the webs of the piston, there shown, should be *flexible.*

The essential character of *web flexibility* and its importance in aluminum pistons is a core of thought which runs through the decision of the Court of Appeals. This reflects the contention of Respondent in the courts below that *web flexibility* was the important thing, and the thing which made the aluminum piston a success.* The Court of Appeals accepted this contention of Respondent, apparently without regard to the fact that this "heart and soul" of the invention was not referred to in the *original applications* for either the Maynard or the Gulick patents.

The decision of the Circuit Court of Appeals, holding the Gulick patent valid, notwithstanding the antithetical amendment five years after filing and more than two years after adverse commercialization, is repugnant to the spirit of this Court's decision in *Powers-Kennedy Corp.* v. *Concrete M. & C. Co.*, 282 U. S. 175. In that case this Court held invalid a patent, the application for which had been radically amended in language calculated to embrace an interfering process. This Court said, l. c. 186—

"This of itself destroys the patent."

So in this case the Gulick patent application was changed from "rigid" to "flexible" to embrace flexible structures which had appeared on the market more than two years before the amendment was made.

If the Patent Office had interpreted the statute (R. S. 4888) as subsequently interpreted by this Court,** Gulick

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*That flexibility was the difference between success and failure (R. p. 122).

**In *Permutit* v. *Graver, supra*, this Court was dealing with a patent the drawings of which showed a space. The specification was devoid of description of the function of the space but the patentee relied heavily on it. This Court held: "drawings * * * are of no avail where there is an entire absence of description of the alleged invention or a failure to claim it" l. c. 60.

A fortiori, when the description is changed from black to white, rigid to flexible.

could not have changed his description save by filing a new application, against which the statutory two-year-sale-bar would have applied.

The Circuit Court of Appeals decision with respect to the Maynard patent is directly contrary to *Permutit* v. *Graver, supra.* Pursuant to the spirit of *Powers-Kennedy Corp.* v. *Concrete M. & C. Co., supra,* the doctrine of *Permutit* v. *Graver* should also have been applied to the Gulick patent.

II.

The Court of Appeals for the Sixth Circuit unduly restricted the doctrine of Adamson v. Gilliland when it accredited the Gulick and Maynard Patents with solving the aluminum piston problem without pointing out wherein the Master and the District Court had erred in their finding that "commercial success" of the aluminum piston was due to things other than these patents.

In all of the courts below Respondent contended that the Gulick and Maynard patents should be accredited as having made possible the commercial success of the aluminum piston.* The only evidence offered to this end was evidence of the payment of royalties pursuant to licenses granted piston manufacturers under *all* of the *eighty patents* in the pool. This evidence failed to convince the Master that any of the patents in suit were commercially successful. On the contrary he discussed other facts, which he held sufficient to justify his refusal to accredit the patents in suit with commercial success. Among the reasons for his refusal were: the admission of Respondent's expert that, in previous litigation, he had claimed the commercial success of the

*Whatever success may have attended the specific construction like Exhibit 1 was largely attributable to "the strength of the hands into which the patent came' (*Textile Machine Works* v. *Louis Herch Tex. Mach., Inc.,* decided by this Court Jan. 3, 1938).

aluminum piston to be attributable to the inventions represented by other patents; that the royalties which Respondent had collected throughout the years were attributable more to the broad and pioneer character of the Franquist, and the Spillman & Mooers patents (now expired) than to patents in suit; and that *Respondent had during their lives represented** the Franquist and Spillman & Mooers patents as being responsible for the commercial success of aluminum pistons, and had sued for and recovered judgments under those patents on account of infringement by the identical accused device here in suit. The Master, in his report (R. pp. 1182-3-4), cited decisions of this court and of the various Circuit Courts of Appeals and District Courts to the effect that commercial success is not persuasive on the question of patentability where other things exist which may directly or indirectly have effected it.

More recently, the Court of Appeals for the Seventh Circuit, in *Therm-O-Proof Insulation Co.* v. *Slayter & Co.*, 80 F. (2d) 557, ruled, as the Master and the District Court ruled in this case, with reference to commercial success under such circumstances. In that case, the Court of Appeals for the Seventh Circuit said:

> "It may be that a license is granted in consideration of a cross-license, and the extensive use is in no way attributable to the alleged invention covered by the claim sued on."

The Court of Appeals for the Sixth Circuit, in reaching a contrary conclusion in this case, not only failed to give the proper force and effect to the findings of the Master

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*The Master held (R. p. 1122-4) Respondent estopped to deny the utility of and effectiveness of those patents, as Respondent attempted to do upon the trial. The Master relied upon *Dalton Adding Mach. Co.* v. *Rockford Milling Co.*, 253 Fed. 187 (D. C. Ill.) and *Rice-Stix D. G. Co.* v. *Striven Co.*, 165 Fed. 639 (C. C. A. 8).

and the District Court, but, in effect, countenanced the pooling of patents and the practice of thereby perpetuating a monopoly by condoning the practice* of Respondent to claim commercial success and achievement for one patent *as long as it lasts*, but when it expires to claim it for *another*. It accepted proof of royalty payments as establishing "commercial success" of two of the eighty pooled patents but rejected the same proof as to another of the pooled patents (Franquist, now expired) saying (R. p. 2387) "of commercial history it has none upon this record."

III.

The Circuit Court of Appeals refused to hold that a decision of this Court, abolishing the legal basis for the grant of the Gulick patent, was "clear and cogent evidence" sufficient to overthrow its presumption of validity.

In *Radio Corp.* v. *Radio Laboratories*, 293 U. S. 1, this Court was dealing with a patent which had issued after a protracted interference contest in the Patent Office and the Courts. This Court there said that such a patent had a presumption of validity "not to be overthrown except by clear and cogent evidence." (293 U. S. 2.)

In this case the Circuit Court of Appeals, in considering the issue of Gulick's right to change his description from "rigid" to "flexible," followed the decisions of the Patent Office and the administrative courts on that issue. The Master and the District Court had held that the administrative

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*The Master said: "Defendants urge that since plaintiff has used the Franquist patent as a basis for this trustee to keep licensees in the fold, and is disowned as it expires, that thereby arises an equitable estoppel. Having abandoned the expired patent, the plaintiff now seeks to perpetuate its monopoly, relying upon another, the newly issued Gulick patent. Defendants urge that if there is no estoppel, then a third patent might issue after the fourteen years had elapsed, replace Gulick, and the monopoly thus be perpetuated indefinitely." (R. p. 1122-3.)

decisions were based upon premises, both legal and factual, which Petitioners had shown to be false.

The legal basis for the administrative decisions was abolished by this Court's subsequent decision in *Permutit* v. *Graver*, 284 U. S. 52. That alone,* we submit, was enough to overthrow the presumption of validity.

Is such "clear and cogent evidence" provided by a decision of this Court showing the legal basis for the grant of a patent to have been wrong? Is a decision of this Court *less forceful*, in overthrowing a patent's presumption of validity, than "evidence" (in the usual sense)? The Circuit Court of Appeals has tacitly held that it was.

Conclusion.

From the foregoing, we submit, it appears that the Circuit Court of Appeals for the Sixth Circuit has misinterpreted, misapplied and refused to follow the decisions of this Court; and that questions of policy and abuse of the Patent Laws are presented, which are important not only to these Petitioners, but to the public, inventors, and industry at large.

Wherefore your petitioners pray that their petition be granted, that the writs of certiorari be issued and the causes reviewed, and the decrees of the Court of Appeals reversed.

Respectfully submitted,

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JOHN H. BRUNINGA,
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Attorneys for Petitioners.

January 7, 1938.

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*The admissions of Respondent's expert, discussed hereinbefore, also nullified the factual basis for those decisions.

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CHARLES ELMORE CROPLEY
CLERK

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1937.

No. [redacted] 3

THE SCHRIBER-SCHROTH COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. [redacted] 4

THE ABERDEEN MOTOR SUPPLY COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. [redacted] 5

THE F. E. ROWE SALES COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

REPLY BRIEF OF PETITIONERS ON PETITION FOR WRIT OF CERTIORARI.

THOMAS G. HAIGHT,
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SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1937.

No. 674.

THE SCHRIBER-SCHROTH COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. 675.

THE ABERDEEN MOTOR SUPPLY COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. 676.

THE F. E. ROWE SALES COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

REPLY BRIEF OF PETITIONERS ON PETITION FOR WRIT OF CERTIORARI.

In order to point out that this is not "an ordinary patent case," as said by Respondent, but, on the contrary, that

these cases are of great legal and public importance, we make this brief reply.

(1) It is not disputed that the Circuit Court of Appeals held **web flexibility** to be the *sine qua non* of the Gulick and Maynard patents.

Respondent says **web flexibility** is common knowledge. Today, yes. When the Gulick application was filed, no. If web flexibility had been known when Gulick filed, there is no plausible explanation of how Gulick came to describe his webs (the only "connection between the piston pin bosses and the skirt") originally as follows (Rec. p. 1839, Resp. Br. p. 18):

> "• • • the above described construction also provides an extremely rigid connection between the piston pin bosses and the skirt of the piston" • • • (emphasis supplied).

It was not until after the flexible web type piston became the popular market piston, through the efforts of Long and others, that "web flexibility" was grafted on Gulick's application by the artifice of amendment, five years* after filing, as follows (Rec. pp. 1839, 1867):

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*Nearly six years after the production of such a piston by Long, a competitor, nearly five years after such Long pistons appeared on the market, over two years after adoption of such Long pistons by Franklin Automobile Company, over two years after the published description of such a Long piston by an engineer of Packard Motor Company, over a year after the advertisement of such a Long piston by Long's licensee (Findings of Fact 21, Rec. p. 1193), and after Gulick's assignee, Packard Motor Company, obtained knowledge of an interference proceeding (Rec. p. 1275) between two other applications pending in the Patent Office involving a claim directed to such a piston construction.

"the above described construction also provides ~~an~~ *a longitudinally*
~~extremely~~ / rigid connection between the piston pin
guide portion
bosses and the ~~skirt~~ / of the piston, which construction may be used either with or without the split
guide portion
~~skirt~~ / and separated head. The arrangement of the supporting flanges 17 between the ends of the piston pin
both
bosses and the connections of those flanges with / the piston skirt provide a particularly strong ~~support for the bosses~~ *construction, and at the same time when the longitudinal split is used, as shown, the web structure has sufficient lateral flexibility to permit the split to close more or less under the action of the expansion forces incident to the heating of the piston.*" (Added matter in italics; original text in regular type; cancellations lined.)

Then and there was the first hint of web flexibility injected into the application. Then and there, the web, which, *for five years*, had been extremely rigid was changed to "longitudinally rigid—laterally flexible." That the two are incompatible, see testimony of Respondent's expert, Record pages 149-150:

"Q. But reading it without that careful word 'longitudinally' when it states 'also provides an extremely rigid connection between the piston pin bosses and the skirt of the piston,' one would naturally assume that the 'extremely rigid connection between the piston pin bosses and the skirt of the piston,' is this web connection right here about at 16, Fig. 1; isn't that right?

A. It would have to be in the connection between the

boss portion and the skirt portion. But then so far as rigidity is concerned that is, of course, incompatible with flexibility. He does have a rigid piston longitudinally, a flexible piston laterally." (Emphasis supplied.)

The above testimony of Respondent's expert witness completely refutes the argument in Respondent's brief (pp. 18 and 19) that "rigid connection" referred to in the Gulick original application meant vertical rigidity and lateral *flexibility*.

Respondent says that the drawings of the Gulick application showed the skilled in the art that there was web flexibility, and that the amendments were made to teach the unskilled* (Brief p. 18). It is immaterial that the experts "looking at the drawings" (Resp. Brief p. 3) alone, thought the structure shown would be flexible, because both agreed that the written words "extremely rigid" completely negatived any possibility of it.** If, as this Court held in Permutit v. Graver, 284 U. S. 52, drawings alone, in the absence of description, cannot repair a defect in disclosure, *a fortiori*, must the law be so when the written description is directly contrary.

The pretense (Resp. Br. pp. 11-13) that "flexibility" was injected to describe a known property of an element rather

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*This is a plain misstatement. It is familiar law that the patent specifications are addressed, not to the unskilled, but to the skilled in the art. Carnegie Steel Co. v. Cambria Iron Co., 185 U. S. 403, l. c. 437:

"The specification of the patent is not addressed to lawyers, or even to the public generally."

**Petitioners' witness Stellman, Rec. p. 873:

"A. He describes a very rigid section between the wrist pin bosses and the skirt of the piston, designated by 17 and 18 in Fig. 4.

Q. Would that convey to your mind that the structure was intended to be very flexible?

A. No, sir; I should say that he intended that it should be rigid."

than to describe essential structure and principle of operation (description of which is required by R. S. 4888, 35 U. S. Code 33) shows the desperation of Respondent to excuse its conduct. A "property" is an inherent thing, and that more than inherent flexibility is required, there can be no doubt from the testimony of Respondents' expert witness:

> "Q. You cannot rely upon the inherent flexibility of any given structure, then, to produce that result, can you? A. No. I think not" (Rec. p. 229*).

The question presented is whether the ruling of the Circuit Court of Appeals for the Sixth Circuit (that "web flexibility" was not only properly a part of the Gulick disclosure, but that "web flexibility" was an essential element of the piston) is compatible with Permutit v. Graver, 284 U. S. 52, and Powers Kennedy C. & M. Co. v. Concrete Mixing Co., 282 U. S. 175, as this Court intended that those decisions be interpreted and applied.

The fact that Respondent, in an effort to support the decision of the Circuit Court of Appeals, has gone to the extreme of contending that it is the drawing, and the drawing alone, of the Gulick patent which makes the disclosure, and that the original specification should be ig-

*See also Rec. p. 229:

"Q. In other words, there must be a deliberate design of the web to produce flexibility?

A. I don't know that there must be deliberate design to produce flexibility, if the design is capable of doing that, but there certainly must be a correct proportioning of the different parts as to location and thickness in order to produce the desired results."

Rec. p. 156:

"Q. You wouldn't say, then, that the inherent flexibility of any structure having cross webs is then sufficient to permit a skirt to contract circumferentially in order to compensate for expansion?

A. No, I would not. This contraction is not a circumferential contraction in the sense that the entire circumference is contracted. It is a reduction of diameter by the closing of this slot, by the general cantilever principle."

nored in so far as it is inconsistent with what is now claimed for the drawing, shows, upon its face, that the Circuit Court of Appeals misinterpreted the cases of Permutit v. Graver, supra, and Powers-Kennedy C. & M. Co. v. Concrete Mixing Co., supra.

(2) Respondent seeks to negative our suggestion of public importance by setting itself up as a benefactor enabling "individual inventors" to "realize remedies which the public intended they should have." Of the eighty patents held in Respondents' pool, the only individual-inventor-beneficiaries are L. P. Mooers (apparently the promoter of the scheme) and H. J. Hater (whose fifty shares were originally issued to his company, Rec. p. 1409). Whether for or against public policy, the scheme is one to enable the pool to claim success and importance for any chosen patent during its life, but thereafter to denounce it as no good; to say of any chosen patent that it, and not the other seventy-nine, is the reason why royalties are paid to the pool; and to say to manufacturers that while the record shows you pay a penny a piston, you get most of this back, and the pool gets the opportunity of claiming commercial success.

Respondents' brief (pp. 22 and 23) raises the additional question whether, by the adoption of Equity Rule 61½, this Court mitigated the standing which, in Adamson v. Gilliland, 243 U. S. 350, it had accorded the report of a Master who saw and heard the witnesses. Respondent says, in effect, that the Court of Appeals for the Sixth Circuit has never treated such a Master's Report "as unassailable" (Adamson v. Gilliland, supra), but, on the contrary, has regarded it as merely "presumptively correct" (Equity Rule 61½).

Respondents' admission (Br. pp. 4-5) that the Department of Justice is now investigating its "repository of patents," as well as the Aluminum Company of America, is a concession that Respondent has manipulated its "repository of patents" to the injury of the public, and is an admission of the public importance of these cases.

(3) It is not denied that Respondent can get practically complete nation-wide enforcement of its patents without going outside the Sixth Circuit. Respondent says that while the automobile manufacturers are in the Sixth Circuit, some of the piston manufacturers are not. The automobile manufacturers are users and sellers, hence as subject to suit as these Petitioners, and one of them (Chrysler) has already been sued (in the Sixth Circuit). Respondent could, of course, go outside the Sixth Circuit to sue piston makers, but we say it has not and it need not. In fact, the maker of the piston accused here invited (Rec. p. 22) Respondent to bring suit against it in its home jurisdiction, the Eighth Circuit, but Respondent would sue only its customers, until finally that maker sued Respondent for an injunction to restrain unfair trade practice, and Respondent counterclaimed (in the Sixth Circuit) for patent infringement.

We submit that the legal and public importance of these cases is sufficient to justify the granting of the writs, and it is prayed that the writs be granted.

Respectfully submitted,

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Supreme Court, U. S.
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CHARLES ELMORE CROPLEY
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SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1938.

No. 3.

THE SCHRIBER-SCHROTH COMPANY,
Petitioner,

vs.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.

No. 4.

THE ABERDEEN MOTOR SUPPLY COMPANY,
Petitioner,

vs.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.

No. 5.

THE F. E. ROWE SALES COMPANY,
Petitioner,

vs.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.

PETITIONERS' BRIEF.

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September 17, 1938.

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PETITIONERS' BRIEF.

OPINIONS OF COURTS BELOW.

The Report of the Special Master before whom the case was tried on its merits is found in pages 1092 to 1189 of the Record. The Master's Findings of Fact and Conclu-

sions of Law are found in pages 1096 to 1109 of the Record. The Memorandum Opinion of the District Court overruling Respondents' exceptions to the Report of the Special Master and adopting the Special Master's Findings of Fact and Conclusions of Law as those of the court is found at Record page 1229 and the Decree entered pursuant thereto at Record page 1230.

The Opinion of the Circuit Court of Appeals (Circuit Judges Hicks, Simons and Allen, Judge Simons writing) is reported at 92 F. (2d), page 330, and appears at pages 2381 to 2395 of the record.

JURISDICTION.

These cases are here on writs of certiorari to the Circuit Court of Appeals for the Sixth Circuit under the provisions of United States Code, Title 28, § 347. The petitions for the writs were, at first, denied, but upon rehearing were granted on May 31, 1938. The judgments of the Circuit Court of Appeals were entered on October 8, 1937 (R. 2379-80).

STATEMENT OF THE CASE.

Parties and Prior Proceedings.

Petitioners were defendants in the District Court, where they prevailed. The Circuit Court of Appeals for the Sixth Circuit reversed the District Court, in part.

Respondent, The Cleveland Trust Company, is* a banking corporation holding title (under a Trust Agreement,

*Herein referred to as "Respondent" or as the "Trust Estate," Chrysler Corporation having been but a nominal and unwilling party plaintiff below.

R. 1345) to a pool of eighty odd patents (R. 2241). The patents included in the pool were assigned to Respondent by the Packard Motor Company (R. 1321), Aluminum Company of America (R. 1322) and others. All of the patents in the pool relate to pistons of the trunk type employed in internal combustion engines, particularly in automobiles.

Licenses under the pool of patents are held solely by The Aluminum Company of America (R. 1381), Bohn Aluminum & Brass Corporation (R. 1414) and Aluminum Industries, Inc. The license to Aluminum Company is exclusive to aluminum pistons (R. 1382), with collateral and sublicenses to Bohn Corporation and Aluminum Industries. All have agreed (R. 182) to pool all patents relating to pistons per se, now owned or hereafter acquired by them. All own shares of beneficial interest in the pool (R. 271), The Aluminum Company of America and the Bohn Company in their own names, and the Aluminum Industries through its officer and principal, H. J. Hater. All pay royalties to the pool on all aluminum pistons made by them and the proceeds are thereafter paid back to the beneficiaries.

Respondent brought three separate suits against the respective Petitioners (three Cleveland dealers in pistons made by Sterling Products Corporation of St. Louis, Missouri), alleging infringement of five different patents. The three cases all involve the same issues (including the same accused device) and were defended by the manufacturer, Sterling (R. 2384). They were consolidated for trial and for argument in the Circuit Court of Appeals. Respondent caused these cases to be referred to a Special Master for trial upon the merits (R. 43). The Master heard the testimony of witnesses, observed tests and considered the evidence which was introduced by the parties. He found (R. 1106-8) all five patents invalid, and further found that the patents, if valid, were not infringed by any

of the several accused devices. Respondent filed many exceptions to the report of the Special Master, but the District Court (R. 1229) overruled all of the exceptions and entered a decree (R. 1230) adopting the Master's Findings of Fact and Conclusions of Law as its own.

Respondent appealed to the Court of Appeals for the Sixth Circuit, with the result that two of the patents [Gulick No. 1,815,733 (R. 1284) and Maynard No. 1,655,968 (R. 1300)] were held to be valid (R. 2395), and to have been infringed by one accused device (Exhibit 1), which the Court of Appeals found as "the one of prime importance to the plaintiff" (R. 2393). As to remaining accused pistons, the Court of Appeals said "we find no infringement" (R. 2394).

As to patents other than the Gulick and Maynard patents, the Court of Appeals stated that "little is claimed for Moocrs and Schmiedeknecht • • • they apparently have no commercial history and have not substantially advanced the art" (R. 2393); and that "Jardine was without substantial commercial recognition" and that "whatever Jardine contributed to the art, if anything, is said to be incorporated in Maynard" (R. 2392). The Court of Appeals dismissed the bills "with respect to the alleged infringement of Jardine, Moocrs and Schmiedeknecht, without prejudice," with the "costs of appeal will be borne by the defendants" (R. 2395).

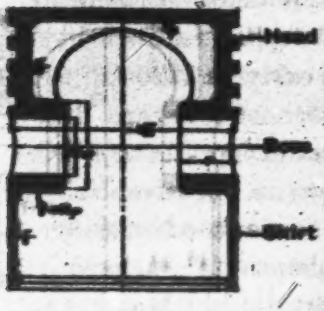
Patents in Suit and Their History.

The patents in suit relate to pistons of what is known as the trunk type, which are used in automobile engines. In such engines the pistons become hot and expand and tend to seize or stick in the cylinder. In the prior art, beginning with Respondents,' expired Spillman and Moocrs (R. 1684) and Franquist (R. 1688) patents, various expedients

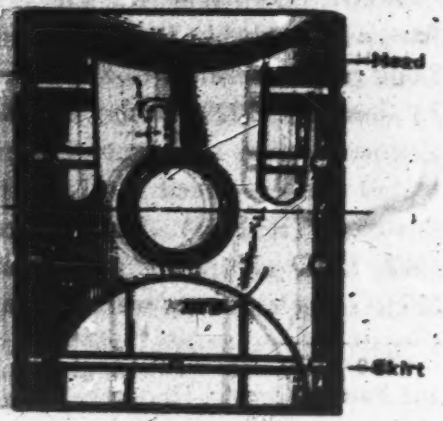
were resorted to in order to automatically compensate for such expansion.

The Court of Appeals apparently regarded the Gulick and Maynard patents as pertaining particularly to pistons made of aluminum, although neither of the patents makes any reference whatever to aluminum. The Court of Appeals also regarded these patents as pertaining to pistons of the "flexible web" type, and, indeed, found an essential element of each to reside in "webs laterally flexible," providing a connection between the pin bosses and the skirt of the piston, although there was no reference to this essential feature in the application for either of them, as filed. For the convenience of the Court we have reproduced (a) a drawing of the ordinary trunk piston of the type involved in these suits, and (b) a cross section of the piston of the Gulick patent showing the "web." This cross section does not contain the numerals which appear in the Gulick patent, as our present purpose is only to assist the Court in understanding what a web is. A true copy of the Gulick drawings appears in an appendix.

(a)
Trunk Piston.



(b)
Gulick Piston.



The importance of this feature of "webs laterally flexible," and its bearing on the question before this Court, will be further discussed in the part of this brief which is devoted to the argument of the case.

The application for Gulick patent was filed in November, 1917, but the patent did not issue until 1921. As filed in 1917, it described the piston as having webs "extremely rigid" (R. 1839). The Gulick application laid practically dormant in the Patent Office from 1917 well into 1922, and during that period of nearly five years replies were generally made to actions by the Patent Office just within the periods of one year allowed by the then existing law. No effort was made to change the description of the webs from "extremely rigid" until September 12, 1922.

During that period of nearly five years one Elmer Long had proceeded to develop his flexible web piston. Long's activities are summarized by the Master (Finding 37, R. 1102-3). Long produced his first piston in March, 1916,* and sold them as early as 1917 for replacement purposes (R. 349). Beginning April, 1920, Franklin Automobile Company sold Long's pistons in its replacement service, and as early as November, 1920, Franklin used them as standard equipment (R. 451). Respondents' witness Jeffries admitted that the Aluminum Company furnished such Long piston castings to Franklin as early as 1920 (R. 940). In January, 1920, Gunn, an engineer of Packard Motor Company, then the owner of the Gulick application, illustrated and described the Long piston in "Automotive Industries" (R. 1668). Furthermore, soon after November 1, 1919, Long shipped some of his pistons to Packard (R. 387). Long's pistons were also advertised in "Motor Age".

*This early date was also given Long by the Court of Customs and Patent Appeals; Hartog v. Long, 47 F. (2d) 369, 370.

of July 7, 1921 (R. 1621), and in "Motor World" of December 28, 1921 (R. 2271).

The Long pistons were the only aluminum pistons on the market before 1922 which compensated for expansion, and Respondents' witness Jeffries admitted this (R. 986). They were not only manufactured and sold by Long, but also by Weems, who later supplied the replacement trade (R. 374). They were sold and used by Franklin Automobile Company until 1926, when the Long piston was replaced by the strut piston, Exhibit AAA* (Jeffries, R. 1008), which is not the Gulick or the Maynard piston, neither of which was used by Franklin (Jeffries, R. 1011). Long was sued by the Trust in 1923 (R. 2261), and that suit was finally settled when Long ceased to make even piston castings and purchased the castings from the licensees under the pool (R. 290).

There is no question but that the Long piston sold to Franklin from 1920 to 1926, and even those sold to the replacement trade by Long and Weems from 1917 on, had the "webs laterally flexible," for Jeffries admitted that very thing (R. 938-9, 1006, 1009-10). There is, furthermore, no question but that these pistons had split skirts, as well as separation of the skirt from the head. A number of Long pistons are in evidence (Exs. E, F, G and FFF), as are also the advertisements of Weems and Long; these pistons were, therefore, in physical existence in the channels of trade from 1917 to 1926. A cut of the Long piston is in the Appendix.

In 1922 there were pending in the Patent Office several applications disclosing the "flexible web" type of piston. An interference involving such a piston was declared between a **Hartog** application (filed February 16, 1920, R.

*See definition of this piston, called "controlled type" (R. 1415).

1798) and a Pomeroy application, the latter owned by Aluminum Company of America. This terminated adversely to Aluminum Company of America on August 10, 1922 (R. 2279). Immediately thereafter steps were taken by Packard Motor Company and Respondent, probably with the aid and assistance of Aluminum Company of America, to monopolize the aluminum piston field. Aluminum Company was then the owner of broad patents covering processes and molds for producing chill cast aluminum alloy pistons and even covering the piston castings per se.*

On September 11, 1922, Packard Motor Company assigned the Gulick application to the pool (R. 1321), and on the next day (nearly five years after it was filed and over five years after the Long piston appeared on the market, and over two years and six months after Hartog had filed), the Gulick application was amended by changing the description from "extremely rigid" to "longitudinally rigid" and, for the first time, adding a suggestion that:

> "the web structure has sufficient lateral flexibility to permit the split to close more or less under the action of the expanding forces incident to the heating of the piston" (R. 1867).

In that amendment, the claim which had been involved in the Hartog-Pomeroy interference, identified as such, was

*See Aluminum Company of America v. Sterling Products Co., 66 F. (2d) 958, C. C. A. 8, which enumerates and discusses the scope of these patents. The Master referred to this case (R. 1141). Likewise did Respondents' witness Jeffries (R. 90, 91), who also described the procedure (R. 104-5), and indeed states that the advent of the aluminum piston began with that procedure (R. 95, 100), and indeed is what made it successful (R. 144).

inserted in the Gulick application (R. 1872), with a statement that:

> "This interference has recently been brought to applicant's attention" (R. 1875).

Thereupon interferences were declared in the Patent Office between the Gulick application and the applications of Hartog, Long and others. Hartog and Long immediately questioned the right of Gulick to make the radical amendment. On April 4, 1934, a tribunal of the Patent Office (R. 1548-50) sustained* Gulick's right to make the amendment.

The Patent Pool and Its Effect.

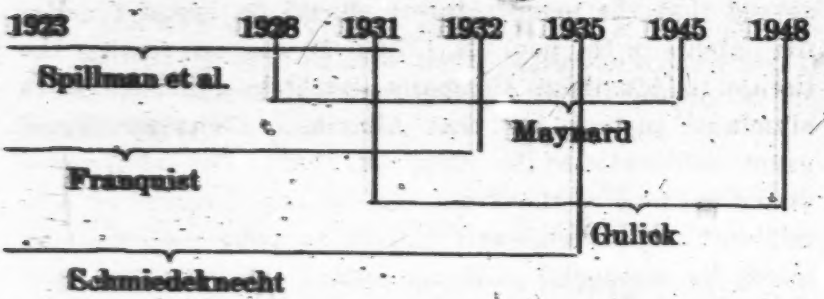
On April 11, 1934, the Trust Estate executed agreements with four piston manufacturers, namely, Aluminum Company of America (R. 1381-92), National Piston Company (R. 1403), Walker M. Levett Co. (R. 1397), and Kant-Skore Piston Company (R. 1408), wherein the manufacturers agreed to assign to the Trust Estate all their piston per se patents, then or thereafter owned, and the Trust agreed that the manufacturers should be licensed under the patents in the pool (R. 1379). It was agreed that the license to Aluminum Company should be exclusive as to aluminum pistons, but that Aluminum Company should grant sublicenses to the others (R. 1382). The sublicensees under the pool of the Trust also became licensees of Aluminum Company under its patents covering processes and molds for producing chill-cast pistons and the piston castings per se (R. 209). On September 19, 1927, Aluminum Company and the principal sublicensee (Bohn Company)

*Subsequently affirmed by the Court of Appeals, D. C., 17 F. (2d) 686, and followed by the Court of Customs and Patent Appeals, 47 F. (2d) 365, 366, 367.

both recognized that a radically different piston, namely, the steel strut piston (Exhibit AAA), came under the patents of the pool (R. 1428 and 1424).

Pistons of the type shown in Exhibit 1, found by the Court of Appeals to be that of the Maynard patent, appeared about 1923 (R. 69). In 1924, therefore, the important piston manufacturers in this country pooled their interests with the obvious intention to extend the monopoly of that particular piston. This was done by bringing the then diversely owned broad Spillman & Mooers patent, No. 1,092,570 (R. 1684), and Franquist patent No. 1,153,902 (R. 1688), together with the then pending Gulick application, into the pool. Subsequently Respondent acquired through Aluminum Company (R. 1322) a one-half interest in the Maynard patent. The Schmiedeknecht patent, No. 1,256,-265 (R. 1306), was also acquired from an incoming sublicensee (Bohn Corporation; R. 1323).

The decision of the Circuit Court of Appeals in this case effectually extended that monopoly from 1923 to 1948. It was done as shown in the following diagram:



Before they expired Respondent represented that the pioneer Spillman & Mooers and Franquist patents were responsible for the success of the aluminum piston (R. 1120-1123, 2299). Licenses were issued (R. 1381, 1408, 1414),

royalties collected (R. 102, 2299), suits brought (R. 101, 2299), judgments recovered (R. 1341), relying upon those patents as dominating flexible aluminum pistons, and they were generally acquiesced in. But upon the trial of these cases, after those patents had expired, they were renounced by Respondent and denounced (R. 99-100, 107, 109, 177, 247) by Respondent's expert as inflexible and unsuited for aluminum construction; indeed that the Franquist piston was "probably worse than a trunk piston" (R. 247) and "just plain no good" (R. 1043). Although the Schmiedeknecht patent was included in these causes (filed in 1931) as covering Exhibit 1 (R. 101), the Court of Appeals said: "Little is claimed for * * * Schmiedeknecht" (R. 2393). That was after its expiration.

The Decisions of the Master and the District Court.

The Master held the Gulick patent invalid in toto because of the attempt to broaden the original application as against intervening rights and because of material changes in the specification and claims after filing (Fact finding 15, R. 1107), relying upon this Court's decisions in Powers-Kennedy Corporation v. Concrete M. & C. Co., 282 U. S. 175 (R. 1146) and Permutit Co. v. Graver Corp., 284 U. S. 52 (R. 1151). The Master and the District Court took due notice (R. 1150, 1229) of the fact that the Patent Office tribunals, as well as the Court of Appeals of the District of Columbia and the Court of Customs and Patent Appeals, had held that Gulick was within his rights in making the before-mentioned radical change in his application. The Master explained his refusal to follow those decisions on the ground that this Court's subsequent decision in Permutit v. Graver, 284 U. S. 52, had removed the legal basis for them; furthermore, that the factual basis upon which

those previous decisions had been predicated, namely, inherent flexibility of a structure shown in the drawings, could not be relied on (R. 1152). Indeed that factual basis was, in this case, admitted* by Respondent's expert witness to have been erroneous. The Master held in effect that his overcame the presumption of validity to which the Gulick patent was normally entitled. The District Court was urged, but declined, to overrule the Master's Report upon the basis of this Court's then recent decision in Radio Corporation of America v. Radio Laboratories, 293 U. S. 1.

The Master found that none of the structures of the patents in suit, including the Gulick and Maynard patents, had gone into commercial use (R. 1182). He found specially that Exhibit 1 (the only one of the accused devices which the Circuit Court of Appeals held to infringe any of the patents in suit), did not have flexible webs (Findings 48 and 50, R. 1105), and that it employed the essential structure function and mode of operation of the Franquist patent (Finding 51, R. 1105). He further found that the piston even as illustrated in the Maynard patent never went into commercial use (R. 1162-3).

In Exhibit 1, the piston is reduced in diameter in the regions of the wrist pin bosses to "relieve" the piston in those regions, and this relief extends beyond the ends of the so-called webs into the bearing faces to provide relieved areas in the form of "keystones," and therefore

*That inherent flexibility of any given structure to produce that result cannot be relied upon (R. 229, 156); that lateral flexibility is established not merely by the presence of a vertical split, but because of the design of the webs to produce flexibility (R. 229); that there must be a correct proportioning of the different parts as related to location and thickness in order to produce the desired result (R. 229); the whole thing has to be designed with the object of gaining the mode of operation and results contemplated (R. 149).

called "Keystone reliefs." The Master found that in Exhibit 1 automatic compensation was accomplished by the "Keystone relief" and not by any web flexibility at the top because of the termination of the circumferential slotting at about the inside of the head flange (Finding 48, R. 1105). Further, that without the Keystone relief the piston of the Maynard patent was completely answered by the Franquist patent piston (R. 1163 and Finding 21, R. 1099), and was nothing but the piston of the Schmiedeknecht patent with the T-slot of the Long piston (R. 1163). A drawing of Exhibit 1 is shown in an appendix. On this drawing the "Keystone relief" is designated.

The Master witnessed the performance of tests with Exhibit 1 (R. 125), as well as with a piston of the Franquist patent (R. 1122 and 1041-2). The Master's findings were adopted by the District Court.

The Decision of the Court of Appeals:

The Circuit Court of Appeals followed the decisions of the Patent Office Tribunals and of the administrative courts, in the interferences involving the Gulick application, without regard to the two very cogent reasons assigned by the Master for his refusal so to do. The Circuit Court of Appeals did not, as the Master and the District Court had done, regard the abolition (by Permutit v. Graver, 284 U. S. 52) of the legal basis for the administrative decisions, or the admission (above mentioned) in this record, of the incorrectness of the factual basis therefor, as sufficient to overcome any strong presumption of validity.

The Court of Appeals in describing (R. 2386) the combination contemplated by the Gulick patent, which it held patentable, included "webs laterally flexible"; and likewise, in describing (R. 2392) the combination of the Mayn-

ard patent, which it held patentable, the Court of Appeals included "flexible webs." The Maynard patent does not state whether the webs are flexible or rigid. The Gulick patent, as issued, says that the webs are flexible, but the application therefor, as filed, described the structure as "extremely rigid."

The Circuit Court of Appeals, therefore, as to each patent, found an essential element of the patented combination something not described in the patent applications, as filed, and as to the Maynard patent not described in the patent as issued.

It is clear from a reading of the decision of the Court of Appeals that the Court was moved to hold the Gulick and Maynard patents valid because of assumed "commercial success." The Master found that no pistons of either of the Gulick or Maynard patents ever went into commercial use. While the Court of Appeals states that the "precise form" of the Maynard patent was sold and used to the extent of many thousands (R. 2393), the Master's report specifically shows that the evidence is the opposite (R. 1162-3). The only evidence adduced to prove commercial success was the payment of royalties under the eighty odd patents in the pool. That was not contradicted, but by cross-examination of Respondent's witnesses it was shown that the success of the aluminum piston was ascribable to other things than the patents in suit, namely, the advent of the permanent molding of aluminum pistons in 1915 (R. 144)*.

From that evidence the Circuit Court of Appeals inferred (R. 2387) that the Gulick and Maynard patents had made the aluminum piston a success.

---

*The Franquist patent, as found by the Master (R. 1119), first disclosed the fundamentals of a successful piston and under that patent the Trust has collected royalties (R. 102), brought suits and restrained infringements (R. 1341).

SPECIFICATION OF ERRORS ASSIGNED AND TO BE URGED.

1. That the Circuit Court of Appeals for the Sixth Circuit erred in finding, and holding patentable, a combination including one element not described in the original applications for the Gulick and Maynard patents in suit, and in refusing to follow this Court's decisions in Permutit v. Graver, 284 U. S. 52, and Powers-Kennedy Corp. v. Concrete M. & C. Co., 282 U. S. 175, as interpreted by other Circuit Courts of Appeal.

2. That the Circuit Court of Appeals erred in accepting proof of payment of royalties under a pool of eighty patents as proof of "commercial success" of the Maynard and Gulick patents, and in rejecting the contrary finding of the Master who heard and saw the witnesses.

3. That the Circuit Court of Appeals erred in holding that the presumption of validity of a patent, however strong, is not overcome when it is shown that the legal basis for an administrative adjudication leading to its issuance had been declared wrong by a subsequent decision of this Court, or when it is admitted that the factual basis for that adjudication was wrong.

4. That the Circuit Court of Appeals erred in reversing and in not affirming the judgment of the District Court holding the patents in suit invalid, and, even if valid, not infringed, and in awarding costs to plaintiff-respondent.

SUMMARY OF ARGUMENT.

A summary of petitioner's argument appears in the captions of the four points which are set forth in the "Argument." It is not thought feasible to expand the summary beyond these captions without unduly lengthening this brief and resorting to very considerable repetition.

ARGUMENT.

We assume that this Court will not consider any questions other than those upon which the petition for certiorari was based. Consequently, we shall not, in this brief, discuss the question of infringement, although it was petitioner's contention before the courts below and it is still insisting that its piston, Exhibit 4, infringes neither the Gulick nor the Maynard patents, even if the latter are valid. Petitioner moreover still insists that these patents are invalid over the prior art as concluded by the Master and the District Court.

Point I.

THE CIRCUIT COURT OF APPEALS TREATED "WEBS LATERALLY FLEXIBLE" AS ESSENTIAL ELEMENTS OF THE GULICK PATENT AND HELD (a) THE PATENT VALID NOTWITHSTANDING THAT SUCH ELEMENTS WERE ADDED TO THE SPECIFICATIONS BY AMENDMENT NEARLY FIVE YEARS AFTER THE APPLICATION WAS FILED AND MORE THAN FIVE YEARS AFTER PISTONS EMPLOYING SUCH WEBS WERE IN COMMERCIAL USE BY OTHERS, (b) ALTHOUGH THE SPECIFICATION AS ORIGINALLY FILED DESCRIBED THOSE WEBS AS "EXTREMELY RIGID." THE COURT OF APPEALS APPROVED THE CHANGE SOLELY ON THE BASIS OF PATENT OFFICE AND ADMINISTRATIVE COURT DECISIONS WHICH IN TURN JUSTIFIED THE CHANGE ON AN INTERPRETATION OF THE DRAWING. THE DECISION OF THE CIRCUIT COURT OF APPEALS IS, THEREFORE, IN CONFLICT, RESPECTIVELY, WITH POWERS-KENNEDY V. CON-

CRETE CO., 282 U. S. 175, AND PERMUTIT CO. V. GRAVER CORP., 284 U. S. 52.

The Gulick Application as Filed, and as Amended:

In the Appendix appears a composite of the specification of the Gulick application as filed and of the patent as issued, with the matter canceled by amendment indicated by crossing out, and with the matter added by amendment in black-face type. From this it will be apparent that the change in the specification was so bold that it is difficult to understand why the Patent Office should have permitted such amendments. We will, however, limit ourselves to the consideration of a feature found by the Court of Appeals to be an essential element of the patented combination, but which was not described in the application as filed, although it now appears in the patent, and as to which the original specification described the very opposite.

The original specification described and the drawing (see Appendix) delineated a piston comprising a **head** 10 having parts 20 depending therefrom, and in which are mounted the **"bosses"** 16 receiving the piston pin, which in turn receives the connecting rod. Flanges 17 are formed on the bosses and extend laterally in the form of **"webs"** 18 which connect with the **skirt** 11. The head and skirt are separated by a circumferential **"slit"** 12, and the skirt is **"split"** vertically at 21 between the webs.

The original specification as filed describes the nature and characteristics of the structure as follows:

> "It will be seen that in addition to providing a piston with a split skirt, the above described construction also provides an **extremely rigid connection** between the piston pin bosses and the skirt of the pis-

> ton, which construction may be used either with or without the split skirt and separated head. The arrangement of the supporting flanges 17 between the ends of the piston pin bosses and the connections of those flanges with the piston skirt provide a particularly **strong support** for the bosses" (R. p. 1839).*

The above description disclosed without question a construction which is not only rigid, but indeed "**extremely rigid**," as distinguished from "**flexible.**" This extreme rigidity is not simply described as being in the piston structure as a whole, but as being specifically in the structure of the **webs** 18 of the flanges 17, which is the only "construction" which, as described,

> "provides an extremely rigid connection between the piston pin bosses and the skirt of the piston"

and which flanges with their webs,

> "provide a particularly strong support for the bosses."*

That description was **not negatived**, but indeed supported, by the drawing. The parts 20 depending from the head to the bosses are of cross formation—a very rigid structure. The webs 18 of the flanges 17 leading from the bosses to the skirt appear in the form of chords subtending arcs of a circle—a well-known rigid structure preventing flexure of either the chord or of the arc. The skirt appears even provided with corrugations and with an inturned flange at the bottom—also well-known expedients for imparting rigidity to cylindrical structures, such as cans, drums, buckets, etc.

In short, the specification as filed described a construction which was not only rigid, but "extremely rigid," and

*Where emphasis appears in quotations, it will be understood that it is supplied unless otherwise noted.

that in the very particular parts which are in issue here, namely, the webs 18 of the flanges 17; and the drawings do not negative but rather support such extremely rigid aspect.

As shown in the Statement of the Case, the Gulick application remained in the condition with the description specifying that the webs provide "an extremely rigid connection between the piston pin bosses and the skirt of the piston," until September 12, 1922, **over five years** after Long pistons having "webs laterally flexible," were on the market and in public use and on sale, and Gulick's assignee had known of Long's commercial piston since 1919. On September 12, 1922, the specification was amended and altered (see Appendix) as follows:

The webs, originally described as providing "an **extremely rigid** connection between the piston pin bosses and the skirt" and "a **particularly strong** support for the bosses," were now described as having "**lateral flexibility.**" The description was further dressed up to change "extremely rigid" to "longitudinally rigid" and to change "support for the bosses" to "construction."

A mere comparison of the original and amended descriptions (see Appendix) will show that the difference between the descriptions of the web structure in the application as filed November 30, 1917, and as amended September 12, 1922, is the difference between "extremely rigid" and "lateral flexibility," which descriptions are as antithetical as black is from white.

The Court of Appeals Treated "Webs Laterally Flexible" as Essential Elements of the Gulick Patent.

The question of whether the original application described the web structure as being "extremely rigid" or

having "lateral flexibility" is not a collateral matter, because that forms indeed the very basis of the decision of the Court of Appeals in holding the Gulick patent valid. The Court of Appeals, after enumerating the "elements" of the "combination" of the Gulick patent, stated:

> "The wrist pin bosses are pulled inwardly from the skirt periphery, and instead of being supported by the skirt are carried from the piston head by depending flanges, thus providing a vertically rigid support for the bosses with freedom of lateral motion in a direction at right angles to the load thrusts on the piston" (R. 2385).

The Court found in the Franquist patent "the broad concept of a flexible skirt" (R. 2386), and found old even "splitting the piston skirt vertically or combining the vertical and longitudinal splits into the so-called T-slot." However, the Court of Appeals did not find in the prior art a combination, including the

> "connection of such bosses to the skirt with webs laterally flexible" (R. 2386).

Finally, the Maynard patent was stated to embody "the Gulick combination," including

> "flexible webs in the region of the wrist pin bosses" (R. 2392).

The Court of Appeals, therefore, found the characteristic feature and essential elements of the Gulick patented combination to be "webs laterally flexible."

This decision of the Court of Appeals accepted the contention of Respondent as to the essential structure and mode of operation of the piston disclosed in the Gulick

patent. This will appear from the following extracts from the testimony of Respondents' expert Dr. Jeffries:

"the yielding characteristics of the web and skirt" (R. 74).

"Q. I am trying to get the pressure on the web. These webs do nothing but carry the skirt; isn't that right; these webs 17 and 18?

A. Oh, they carry the skirt and they carry the wrist pin and they flex; they have quite a number of functions" (R. 148).

"The Gulick webs, however, are flexible in the other lateral direction, which flexibility permits the opening and closing of a vertical slot in the skirt of the Gulick piston. These webs in the Gulick construction are designed to produce such flexibility" (R. 196).

"The Gulick flexibility is gained by flexible webs and flexible skirt and co-operation between horizontal and vertical slots permitting the flexing of the skirt. This may be referred to as the cantilever principle" (R. 203).

The Change in the Gulick Application Was Not Permissible Under Powers-Kennedy Co. v. Concrete Co.

The Master discussed the decisions of this Court (R. 1144-46) and came to the conclusion that the change in the Gulick application was not permissible under the decision of this Court in Powers-Kennedy Co. v. Concrete Co., 282 U. S. 175. The District Court affirmed that conclusion. The Court of Appeals apparently did not consider the Powers-Kennedy Case, but simply agreed with (R. 2391) the conclusions of the Patent Office and of the administrative courts in the interferences in which the Gulick application was involved. But the decision of the Court of Appeals of the District of Columbia (17 F. [2d] 686) was prior to the decision of this Court in the Powers-Kennedy

case. While the decision of the Court of Customs and Patent Appeals (47 F. [2d] 366) was shortly after the Powers-Kennedy decision, not only did that Court rely upon the decision of the Court of Appeals of the District of Columbia, but it apparently did not consider the Powers-Kennedy case at all.

There can be no doubt that the equitable doctrine announced by this Court in 1878 in Railway Company v. Sayles, 97 U. S. 554, 563, and adhered to in later decisions, particularly in 1930 in Powers-Kennedy Co. v. Concrete Co., applies here with such force as to destroy the Gulick patent.

In **Railway Company v. Sayles** this Court says, 97 U. S. l. c. 563-4:

> "It will be observed that we have given particular attention to the original application, drawings, and models filed in the Patent Office by Thompson and Bachelder. We have deemed it proper to do this, because, if the amended application and model, filed by Tanner five years later, embodied any material addition to or variance from the original—anything new that was not comprised in that—such addition or variance cannot be sustained on the original application. The law does not permit such enlargements of an original specification, which would interfere with other inventors who have entered the field in the meantime, any more than it does in the case of reissues of patents previously granted. Courts should regard with jealousy and disfavor any attempts to enlarge the scope of an application once filed, or of a patent once granted, the effect of which would be to enable the patentee to appropriate other inventions made prior to such alteration, or to appropriate that which has, in the meantime, gone into public use."

Here we have the Gulick original application which, five years after the Long piston appeared on the market, was amended to embody, not only a "material addition" but indeed a material "variance from the original"; accordingly, such addition or variance cannot be sustained. That "webs laterally flexible" constitute something material cannot be disputed, because it was that feature which the Court of Appeals found characterized the alleged Gulick contribution to the art. That "webs laterally flexible" constitute a variance from "an extremely rigid connection" is so self-evident that there can be no question about it.

Powers-Kennedy Co. v. Concrete Co., 282 U. S. 175, involved a change in the specification of an application after filing under conditions closely analogous to the situation we have here. The McMichael patent in suit was for an apparatus for mixing and conveying materials, particularly concrete, in which an air pipe was shown for the purpose of agitating the concrete and preventing it from packing. The original application was filed January 14, 1907, and changes were made in the specification and new claims were added in 1911 and expanded in 1913, particularly by assigning to an air pipe the function of impelling movement of the concrete rather than agitation so as to inject what this Court called a "so-called slug theory" into the case. This change in front appeared under the following circumstances:

A certain Leake application was filed in the Patent Office about nine months after McMichael filed, and the McMichael and Leake applications were thrown into interference; the McMichael interest, however, purchased the Leake application with the result that both patents were

granted, the McMichael patent in 1915 and the Leake patent in 1917. This Court said (p. 185):

> "'And, even if the mode of operation is as claimed, it is to be remembered that Leake in his application of October 7, 1907, uses the same words to describe the operation of his nozzles as we find McMichael subsequently inserted in his specifications and claims. When this application came into interference with McMichael's, he, of course, became familiar with Leake's claims. It is significant that he then amended his claims, almost in the very words of Leake. This of itself destroys the patent. Railway Co. v. Sayles, 97 U. S. 554; General Electric Co. v. Sangamo Electric Co., 174 Fed. 246; Lopuleo Systems, Inc., v. Bonnot Co., 24 F. (2d) 510.'"

Here, for nearly five years and while the Long flexible web pistons were on the market (for nearly three years with the knowledge of Gulick's then assignee) the Gulick application described the webs as being "extremely rigid." After Aluminum Company had lost the Hartog-Pomeroy interference based on claims and descriptions in a Hartog application filed February 16, 1920 (R. 1798), and after Gulick's then assignee had obtained knowledge of that interference (R. 1875), the Gulick application was assigned to the Trust Estate and on September 12, 1922, was amended to change the description of the webs from "extremely rigid" to "laterally flexible." This, as in the Powers-Kennedy case, was "almost in the very words" of Hartog and, of course, described the Long pistons which admittedly had webs laterally flexible (Jeffries, R. 938-9, 1006, 1009-10). The Powers-Kennedy case is directly in point and the principle of that decision renders the Gulick patent invalid.

The Change in the Gulick Application Was Not Permissible Under Permutit v. Graver Corp.

The Master considered Permutit v. Graver, 284 U. S. 52, and concluded (R. 1150-1):

> "While the decisions of the Patent Office in the several piston cases were affirmed by Courts on appeal, such decisions now appear to have been founded upon a misconception of Revised Statute 4888, as were prior decisions of the Federal Courts which were overruled by the Supreme Court in the recent Permutit Co. v. Graver Corp., 284 U. S. 52."

The District Court affirmed the Master. The Court of Appeals, however, completely ignoring the fact that this court's decision in Permutit v. Graver was subsequent to the decisions of the administrative courts approved the decisions of the administrative courts, despite the fact that the description of the web structure had been changed from "extremely rigid" to "laterally flexible." That, we contend, was directly contrary to Permutit v. Graver. It will be recalled that in that case this Court held that if the specifications did not describe an essential element, it could not be supplied by reference to the drawings, it being permissible to refer to the latter only "for illustration" or "as an aid in interpreting the specifications or claim."

While Permutit v. Graver was a case involving failure of the specification of an issued patent to describe an essential part of the alleged invention of the patent, the logical conclusion is that if a court may not read into a specification of an issued patent something shown only in the drawing, certainly the Commissioner of Patents cannot permit a specification to be amended on any such basis, especially where, as in this case, the changed description

is the very antithesis of what was originally described in the specification, particularly when it is made long after intervening rights have arisen. Railway Company v. Sayles, 97 U. S. 554, and Powers-Kennedy Co. v. Concrete Co., 282 U. S. 175, cited under the preceding heading, were cases involving changes of the specification as filed, particularly against intervening rights.

R. S. 4888, 35 U. S. C. 33, makes no distinction between a patent as issued and an application as filed. It provides:

> "**Before** any inventor or discoverer shall receive a patent for his invention or discovery, he shall * * * file in the Patent Office a written description of the same * * *."

R. S. 4888 also requires that an inventor of a machine

> "explain the **principle** thereof and the best mode in which he has contemplated applying that principle."

There can be no doubt but that provision applies to the piston here involved. We have seen that in the Powers-Kennedy case this Court condemned the change in the specification as filed—from agitation of the concrete to impelling its movement—so as to introduce what this Court called a "so-called slug **theory.**" That, of course, involved a change introducing a different "**principle.**" Here the change in the original specification of the description of the web structure from "**extremely rigid**" to "**laterally flexible**" certainly involved a change introducing not only a different principle of operation but one which was the **very antithesis** of the principle of operation as well as of the essential structure originally described. Identically the same situation was involved in Permutit v. Graver. The Commissioner of patents should not have per-

mitted such an amendment in a pending application any more than a court should read such an amendment into an issued patent.

The situation here is substantially on all fours with the situation in Permutit v. Graver; indeed, the nature of the insufficiency is so closely analogous that the language in the Permutit-Graver case can readily be paraphrased. The case applies to the **Gulick** patent, because there was no description in the application **as filed**, nor in any original claim of "webs laterally flexible." The case also applies to the **Maynard** patent, hereafter more fully discussed, because neither in the Maynard application **as filed**, nor in the patent **as issued**, do we find any description, nor any claim, of "flexible webs in the region of the wrist-pin bosses."

In **Permutit v. Graver**, as here, the patent was contended to be for a certain structure having a certain novel characteristic feature. The patent was for a water softening apparatus which is described in the opinion of this court, 284 U. S., l. c. 55 and 56. Briefly stated, the apparatus comprised a container with water inlet and outlet connections and containing a charge of a water softening reagent (zeolite), the container having an open space above the zeolite to permit, as this court says (p. 56):

> "the zeolite to rise or boil, and to spread out and reform in the bed,"

and to provide a "free" rather than a "locked" zeolite bed.

This court says (p. 56):

> "First. The apparatus described in the specification closely resembles sand filters long used. The elements enumerated above, alone and in combination,

> are confessedly old. The only invention seriously urged under Claim 1 is the substitution of a 'free' for a 'locked' zeolite bed—a matter which is not referred to either in the specification or in the claim."

As to the Gulick application, we can paraphrase the above language as follows: "the only invention" (urged by plaintiff and found by the Court of Appeals) resides in the substitution of "webs laterally flexible" (free) for "an extremely rigid connection" (locked). Here the situation is aggravated by the fact that while in Permutit v. Graver the specification was silent, in the original Gulick application the original description was just exactly the opposite from what it was when amended.

This court further says, page 57:

> "There is no mention in the specification of either a 'free' or a 'locked' zeolite bed; or of the alleged discovery that a rising space above the zeolite bed is necessary for the successful operation of the softener."

In the original Gulick application there was no mention of any alleged discovery that "webs laterally flexible" were necessary for the successful operation of a piston, but rather than "an extremely rigid connection" was necessary.

This Court then discusses the decision of the Courts of Appeals in the cases involving that patent, which relied upon a showing in the drawing, as distinguished from a description, and this Court says, p. 59:

> "The drawing annexed to the specification, it is true, shows a layer of sand or quarts at a point above the zeolites and an unoccupied space between it and the top of the zeolite bed,"

but this Court says, p. 60:

> "Moreover, while drawings may be referred to for illustration and may be used as an aid in interpreting the specification or claim, they are of no avail where there is an entire absence of description of the alleged invention or a failure to claim it."

If drawings may be referred to only for illustration of what is described, then the web of the Gulick drawing could only be used as an aid to the original description, which was of "an extremely rigid connection"; it could not be used as an aid to the very opposite, namely, "laterally flexible." Furthermore, if drawings are of no avail where there is an entire absence of description, they surely cannot be an aid to something which is the very opposite of that originally described.

The Factual Basis for the Change in the Specifications and Upon Which the Decisions of the Patent Office and of the Administrative Courts Were Based Have Been Shown to Be Erroneous.

The Master, after considering Permutit v. Graver, found as follows (R. 1152):

> "There were no metes and bounds fixed in the Gulick structure, and plaintiff must fail if inherent flexibility is relied upon, as was done in the Patent Office."

It will be seen by an examination of the opinions of the Patent Office tribunals and the administrative courts, that they found that the web shown in the drawings of the Gulick patent was **inherently flexible.** They thought that the change in the specifications was justified in view of this fact. The Circuit Court of Appeals relied upon those

decisions (R. 2385). The evidence in the case at bar, however, shows that **inherent** flexibility is not enough, but that, in order for a web to be latterly flexible so that the piston may properly function, it must be specifically designed to secure the desired result. This appears from the testimony of respondents' own witness, **Dr. Jeffries.** This fact demonstrates the correctness of the decision in **Permutit v. Graver**, supra, as it does also that the Circuit Court of Appeals erred in not holding that that decision was applicable to and governs the case at bar.

When Dr. Jeffries was cross-examined about the expression "an extremely rigid connection," as found in the original application, he not only admitted that it had reference to the **web 18** (R. 150), but he specifically says:

> "It would have to be in the **connection between the boss portion and the skirt portion.** But then so far as **rigidity** is concerned, that is of course **incompatible with flexibility.** He does have a rigid piston longitudinally, and a **flexible** piston laterally."

Finally, Dr. Jeffries had to admit that the **sole descriptive basis** for "webs laterally flexible," as found in the Gulick patent as issued, is found in the **part added by amendment** (R. 173).* Since, therefore, the description

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*"Q. Now, you don't find any description in the Gulick patent as to definite proportioning of thickness of web to secure flexibility, do you? A. Yes.

Q. You mean a specific statement to that effect, that the web is proportioned to secure flexibility? A. Well, I will find what I had in mind on that point. (After examining patent.) Beginning line 17, page 2, 'The arrangement of the supporting flanges 17 between the ends of the piston pin bosses and the connections of those flanges with both the piston guide portion and the head provide a particularly strong construction and at the same time, when the longitudinal split is used, as shown, the web structure has sufficient

was only in the amendment, Respondent had to rely solely on the drawing. As to what the drawings tell him, Dr. Jeffries testifies as follows:

> "Q. Well, I am asking now about the drawings. You can read drawings, and to your mind they give you a complete picture, don't they?
>
> A. Fairly complete, yes.
>
> Q. And those drawings, with the simple statement that the piston is made to take care of expansion, that would be enough to give you the idea that the webs should be properly proportioned to flex?
>
> A. I think so.
>
> Q. Due to the inherent structure?
>
> A. Yes" (R. 158).

In other words, "inherent structure" of something shown in the drawings was again relied on here, as in the Patent Office and before the administrative courts. Let us now see what Dr. Jeffries further said about that, particularly on Cross-Examination.

Dr. Jeffries testified as follows:

> 1. That inherent flexibility of any given structure

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lateral flexibility to permit the split to close more or less under the action of the expansion forces incident to the heating of the piston.'

Q. You think that is full and complete? A. Yes, that is a complete statement as to the function and mode of operation of those webs.

Q. Particularly from lines 24 to 27, isn't that right? A. Yes, when the longitudinal split is used; that is, from *lines 23 to 27*.

Mr. Bruninga: Well, just as part of the defense, in order to connect it up, I want to say that we will show that that was *added by amendment*" (R. 173).

to produce that result cannot be relied upon.* ††

2. That lateral flexibility is established not merely by the presence of a vertical split, but because of the design of the webs to produce flexibility.*

3. That there must be a correct proportioning of the different parts as related to location and thickness in order to produce the desired result.*

Dr. Jeffries also sets out the following limitations: that flexing is not only a matter of size, but is also a matter of construction (R. 155); that the web thickness is a complicated thing and depends upon the functions required to be performed (R. 152); that the desirability for lateral flexibility determines the thickness of the webs (R. 148); that the webs can be made too flexible for proper functioning (R. 149 and 263); that there is a maximum web thickness for proper functioning (R. 155); that the webs can be made so as not to flex enough, and to flex too much for proper functioning (R. 156); that web flexibility is not merely a function of the web thickness, but is also a function of web height (R. 156), and is also a function of the web length (R. 1050); that in 1917 (when the Gulick appli-

*"Q. And flexible because there is a split between the webs? A. Flexible because of the split and because of the *design* of the webs to produce flexibility.

Q. In other words, there must be deliberate design of the web to produce flexibility? A. I don't know that there must be deliberate design to produce flexibility, if the design is capable of doing that, but there certainly must be a *correct proportioning* of the different parts as to *location and thickness* in order to produce the desired results.

Q. You *cannot rely upon the inherent flexibility* of any given structure, then, to produce that result, can you? A. *No*, I think not" (R. 269).

††"Q. You wouldn't say, then, that the *inherent flexibility* of any structure having cross webs is then sufficient to permit a skirt to

cation was filed) the design of the structure to get the right web-flexure was "quite a task" (R. 157).

Indeed, Dr. Jeffries says (R. 149):

> "Oh, I think the whole thing has to be designed with the object of gaining the mode of operation and results contemplated."

And further (R. 227-28):

> "Q. And if you split almost any Ricardo slipper vertically, no matter what the thickness is, that is the thickness that is ordinarily used in the Ricardo piston at that time, you would have enough inherent flexibility there to be operative in an engine; isn't that right?
>
> A. Yes, I think that is not a fair conclusion. That is, there first had to be the idea of making a piston of that construction operate satisfactorily, that idea utilizing the flexibility due to co-operation of the horizontal and vertical slots; and *then there had to be the matter of proportioning* the various parts so that that flexibility would be proper to properly operate in the motor."

The above testimony of Respondent's own expert, Dr. Jeffries, should be sufficient to show that in this case drawings alone are not sufficient, absent description, even if they do happen to show a construction which, if followed as to dimensions, will produce a flexible web structure.

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contract circumferentially in order to compensate for expansion? A. *No*, I would not. This contraction is not a circumferential contraction in the sense that the entire circumference is contracted. It is a reduction of diameter by the closing of this lot, by the general cantilever principle" (R. 156).

Point II.

THE CIRCUIT COURT OF APPEALS UPON RESPONDENT'S CONTENTION TREATED "FLEXIBLE WEBS IN THE REGIONS OF THE WRIST PIN BOSSES" AS ESSENTIAL ELEMENTS CHARACTERIZING THE PISTON OF THE MAYNARD PATENT, PRESUMABLY RELYING UPON AN INTERPRETATION OF THE DRAWING, NOTWITHSTANDING THAT THE SPECIFICATIONS ARE SILENT WITH REFERENCE TO WEB FLEXIBILITY; ITS DECISION IS THUS CONTRARY TO PERMUTIT V. GRAVER, 284 U. S. 52.

The patent (see drawing in Appendix) describes a piston comprising a head A and a skirt D whose sides are dashed in to provide what the patent calls "webs F" connected to the head and carrying wrist pin bosses G. Grooves or slots E extend part-circumferentially around the piston between the head and the skirt, and a split I on one side of the skirt forms with one of the circumferential grooves a T-slot. Recesses H are formed between bottom arcuate skirt portions and the so-called webs F.

Here we again have a piston which is essentially rigid in the regions of the wrist pin bosses. The so-called webs are tied to the head at the top, while at the bottom we have an arc and a chord—an essentially rigid construction. There is not a word in either the application as filed or in the patent as issued about "flexible webs in the regions of the wrist pin bosses." The Master found (R. 1162) "Any reference to flexing of the skirt is omitted from the Maynard patent." The patent does not even say whether the piston is to be of aluminum, iron or steel.

The Court of Appeals said as to this patent (R. 2392):

> "Maynard upon a patent application filed January 3, 1921, embodies the Gulick combination of skirt insulation, skirt flexibility by means of vertical slotting co-operating with longitudinal slotting, and flexible webs in the region of the wrist pin bosses."
>
> "He also follows Jardine's simplified design to permit economical manufacture and Jardine's boss relief."

Here again the Court of Appeals' opinion was not based upon any statement in the specifications, but on the interpretation of the drawings by Respondent's expert, Dr. Jeffries. The pertinent parts of his testimony are as follows:

> "And one of the features of the Maynard piston is flexibility, and the flexibility of the skirt portion and the webs co-operate to produce the Maynard effect" (R. 122).
>
> "Q. And that would not happen in Maynard?
>
> A. That would happen in Maynard to an extent, but Maynard has flexibility.
>
> Q. Flexibility between the wrist pin bosses and the skirt section?
>
> A. Yes, and also some web flexibility at the top of the skirt.
>
> Q. Some web flexibility at the top of the skirt?
>
> A. Yes.
>
> Q. More web flexibility than Mr. Ricardo?
>
> A. Well, Ricardo has no web flexibility, because he has no place for the web to flex. He has the rigid, nonflexible structure, whereas Maynard has a flexing structure.
>
> Q. Even a flexing structure at the top of the web?
>
> A. Yes" (R. 261).

Dr. Jeffries really admitted that the Maynard patent specification does not describe the webs as even designed to flex (R. 1037):

> "Q. But can't you answer my question when I ask you, do you want the Court to understand that in the operation of the piston the part about ⅛ of an inch long flexes?
>
> A. Yes, I think it does. I think I have said that a good many times. I think I have got very good grounds for saying it, although I don't know that that itself makes a whole lot of difference, because Maynard doesn't necessarily say that that particular part has got to flex; he gives a construction which operates in a motor and the construction is similar to that construction of Exhibit 1."

It is interesting to note that Dr. Jeffries' position as to Exhibit 1, decided by the Court of Appeals to infringe the Maynard patent, was that the web "is flexible because the web is made thin" (R. 1036), although as previously shown by Dr. Jeffries a piston web in order to flex properly must be designed and proportioned so as to be neither too thin nor too thick, nor too long nor too short, nor too wide nor too narrow. Indeed, Dr. Jeffries admitted that even in a piston like Exhibit 1 the web structure, if too thick, will cause the piston "to score or to grub" (R. 1043).

Here, then, we have a situation where the Court of Appeals found an essential element, distinguishing the Maynard patent, to reside in "flexible webs in the region of the wrist pin bosses," although there is not a word about such flexible webs in even the patent as issued. That is, of course, directly contrary to the decision of this Court in Permutit Co. v. Graver Corp., 284 U. S. 52. Moreover, here again we have the same situation as we had in the

Gulick application, namely, that a piston in order to function by virtue of web flex, must have that web designed to flex, and must be proportioned to so flex, so that again any factual basis is lacking.

Point III.

THE CIRCUIT COURT OF APPEALS WAS NOT JUSTIFIED IN FINDING THAT THE ALUMINUM PISTON PROBLEM WAS SOLVED BY EITHER THE GULICK OR MAYNARD PATENTS OR THAT THE COMMERCIAL SUCCESS WHICH HAS ATTENDED THE ALUMINUM PISTON WAS DUE TO EITHER OF THOSE PATENTS; AND IT ERRED IN OVERRULING THE MASTER AND DISTRICT JUDGE IN THESE RESPECTS.

This Court, in Adamson v. Gilliland, 242 U. S. 350, 353, quoted with approval from its prior decision in Davis v. Schwartz, 155 U. S. 631, 636, as follows:

> "so far as the finding of the master or judge who saw the witnesses 'depends upon conflicting testimony or upon the credibility of witnesses, or so far as there is any testimony consistent with the finding, it must be treated as unassailable.'"

This rule was recently reiterated by this Court in Alabama Power Co. v. Ickes, 302 U. S. 464. See, also, Rule 52 of the new Rules of Civil Procedure. In the case at bar the facts were found specially by the Master and adopted by the district judge. There was ample testimony, consistent with the finding of the Master and district judge, and, as we will now demonstrate, the latter finding was not only not clearly erroneous but was eminently correct.

The reference was upon the motion of and at the insistence of Respondent (R. 43) over Petitioner's objections (R. 44); and the order directed the Master "to observe such tests as the parties may perform or cause to be performed" and to "rule upon the admissibility of evidence, and to report his conclusions of law and findings of fact" (R. 44). The Master did so. After the trial, briefs and arguments, he transmitted to counsel copies of his Draft Report and invited suggestions to the end that error might be corrected (R. 1274). Respondent's counsel acknowledged receipt of the Draft Report but specifically declined to offer suggestions or corrections (R. 1274-5).

The Court of Appeals' decision, after stating Respondent's contention that "the aluminum piston problem was completely solved by some of its assignors," enumerating Gulick, Jardine and Maynard (R. 2383), states:

> "Limited success may here and there have been attained, but the problem in its full sweep was not solved until the Gulick concept, carried forward to some extent by Maynard, with possibly some instruction from Jardine, reached commercial embodiment. Then, and then only, did the industry by acceptance of the Aluminum Company's piston answering the Maynard drawing and specification, recognize the complete solution of the problem, and the many millions that have since been sold and used have set the seal of commercial approval upon such solution." (R. 2387-88).
>
> "That the Maynard piston had a very great effect upon the industry and substantially advanced the art, there can be no doubt upon this record. In the precise form disclosed by Maynard and depicted in his drawings, many thousands were made and successfully used. In a somewhat modified form its produc-

tion and use has run into very many millions'" (R. 2393).

The respondent's claim of commercial success was presented squarely to the Master, who ruled with reference thereto as follows:

> "The situation here is peculiar, for the structures of none of the pistons in suit have ever gone into commercial use. That of Schmiedeknecht, Mooers, Gulick and Jardine not at all, while as to the Maynard design, the proof is that it was not used successfully until it had been provided with the Keystone relief. Particularly as to the Maynard piston it was discarded by Chrysler, an unwilling party plaintiff which has the right to its use as a half-owner of the patent" (R. 1182).
>
> "Nowhere in the patent (Maynard) is there any statement about Keystone relief, found necessary to make function commercial pistons like Exhibits 1 and 17" (R. 1162).
>
> "While two rough castings were produced without the Keystone relief, the record shows that after the filing of the Maynard patent application, change was made to give the Keystone relief (Ex. 22)" (R. 1162-3).

There was ample testimony consistent with the findings of the Master affirmed by the District Court, while the findings of the Court of Appeals are not consistent with the evidence, and are erroneous. This we will now demonstrate.

No Gulick or Maynard Pistons Went Into Commercial Use. This was admitted by respondent's witness Jeffries as to the Gulick patent (R. 146). As to the Maynard patent, it admittedly contains no description of the Keystone relief

(R. 130), and even the drawing does not disclose it (R. 225). It will be recalled that the Keystone relief is used in the accused Exhibit 1, and, as the Master found, permits automatic compensation for expansion in that piston (R. 1105, Finding 48). The Maynard patent does not, therefore, either describe or illustrate Exhibit 1 with its essential Keystone relief.

The finding of the Court of Appeals that "in the precise form disclosed by Maynard and depicted in his drawings, many thousands were made and successfully used" (R. 2393), was based upon the statement of respondent's witness Jeffries on direct examination (R. 78), which statement, upon cross-examination, was shown based on hearsay, for Jeffries admitted that he never installed or even saw such a piston, but saw only drawings (R. 1045); he did not even know whether any such piston ran for one hundred miles (R. 1046). Further, on cross-examination, Jeffries only produced unfinished castings (Exs. 3-M and 3-N), which admittedly did not have that Keystone relief (R. 135). On redirect examination (R. 189) he produced drawings (Exs. 21 and 22, R. 1337-40). Of these only Exhibit 22 shows the Keystone relief, but it also shows by "their wire" (evidently Oakland's) that the Keystone relief was "added" February 10, 1925, over four years after the filing of the Maynard application.

The Maynard Patent Did Not Advance the Art. If we take the piston shown in the Maynard patent, but without the Keystone relief or webs laterally flexible, neither of which is disclosed therein, then as to its fundamental structure, as stated by the Master (R. 1163):

> "The Franquist piston is a complete answer to the Maynard piston, for it shows the structure, function and mode of operation of the Maynard patent."

And as found by the Master (R. 1099):

> (21) "The Maynard patent embodies the fundamental structure of the Franquist patent No. 1,153,902, and that the splitting of the skirt by through and through slotting was within the purview of one skilled in the art."

The Court of Appeals agreed with the Master that

> "Franquist, of course, does disclose the broad concept of a flexible skirt" (R. 2386).

In the Franquist patent (R. 1688), see drawing in appendix, the head 2 of the piston is separated from the skirt by quarter circumferential slots 17 in the regions of the bearing or thrust faces 15 and the skirt is also depressed or relieved in the regions 14 of the wrist pin bosses 6. The skirt is also slotted vertically at 13 to compensate for expansion, although the slots do not go all the way through the skirt. However, the Court of Appeals agreed with the above-quoted finding of the Master that the following was also old:

> "splitting the piston skirt vertically or combining the vertical and longitudinal splits into the so-called T-slot" (R. 2386).

The Master, therefore, properly found (R. 1163):

> "that all Maynard did was to put the T-slot of Long on the piston of Schmiedeknecht."

Of course, that is all Maynard really did. The Long piston is illustrated in the Appendix in connection with the pistons of the Franquist, Schmiedeknecht and Maynard patents. Long followed the concept of Franquist in partially severing the skirt from the head by part circumfer-

ential slots. Long then provided a vertical slot which with one of the circumferential slots formed the T-slot. Maynard simply took the T-slot of Long and placed it on the Schmiedeknecht piston in the same place that Long had done. The Schmiedeknecht piston is the prototype of the Maynard piston. Indeed, it was so considered by Respondent, who not only issued licenses and collected royalties thereunder, but brought suit against and secured a decree against Sterling's customer (Simmons) by reason of Simmons selling a piston like Exhibit 1 (R. 101).

Exhibit 1 Cannot Be Relied Upon as Establishing Commercial Use by Gulick and Maynard. The Master described this piston (R. 1116) as

> "a stiff piston, being a truss construction with a chord spanning an arc, and when this piston scored, resort was had to what is now known as the 'Keystone relief.'"

The Master specifically found (R. 1105):

> (48) "That in Ex. 1 automatic compensation is accomplished by what has been termed the 'Keystone relief' and not by any web flexibility at the top; that the circumferential slotting terminates at about the inside of the head flange and that such a construction and arrangement does not secure the operation contemplated by the Gulick, Jardine and Maynard patents."

This finding was not only based on tests which the Master stated he had witnessed (R. 1092) in accordance with the Order of Reference (R. 44), as well as upon demonstrations to which he refers (R. 1122), but the above finding was based upon the testimony of Respondent's

own witness, Dr. Jeffries, who, in stating the metes and bounds of the Jardine patent piston (said by the Court of Appeals to be incorporated in the Maynard piston and to follow the Gulick patent) (R. 2392), as follows:

> "Q. Would you say that the objects and advantages and purposes of the Jardine patent are secured if the slots 29 were shortened to terminate about the inside part of the ring flange 23?
>
> A. It would be quite difficult to secure successful operation under those conditions" (R. 230-1). (See drawing R. 1294.)

That is exactly what we have in Exhibit 1, namely, the slot going into the web terminates about the inside part of the ring flange. That should dispose of this case, for the Master's finding is not only supported by the evidence, to say nothing of reason and common sense, but is affirmed by the testimony of plaintiff's own expert, Jeffries.

The Master further found (R. 1105):

> (51) "That defendants' pistons, Ex. 1, employs the essential structure, function and mode of operation of the prior art, more particularly the Franquist patent No. 1,153,902."

The Master made the above finding after witnessing tests of the Franquist piston as stated by him (R. 1122). See also R. 1041-2. Stellmann, former Chief Engineer of the Franklin Automobile Company, also explained the operation of Exhibit 1 as related to the Franquist piston, and that they are the same (R. 526). That was really admitted by Dr. Jeffries (R. 128).

It is axiomatic, of course, that an accused device (Ex. 1) cannot infringe an unexpired patent (Gulick or May-

nard) when it has the essential structure, function and mode of operation of an expired patent (Franquist), even when that expired patent is supplemented by something (Keystone relief) not disclosed in that unexpired patent, and which gives a distinctly different mode of operation. It is self-evident, therefore, that Exhibit 1 cannot be relied upon as establishing commercial success of Gulick and Maynard.

The Long Pistons Were in Commercial Use From 1917 On.

The statements of the Court of Appeals that there was only "limited success here and there" prior to the advent of the Maynard piston and that "then and then only did the industry • • • recognize the complete solution of the problem" (R. 2387-88) are not based upon the evidence, but the contrary is true.

The Maynard piston, according to Dr. Jeffries, did not appear on the market until 1923 (R. 69). But as we have shown in the Statement of the Case and as found by the Master (Finding 37, R. 1102-3), the Long pistons (see cut in Appendix) were developed as early as 1916, were sold in the replacement trade from 1917 on, were adopted by Franklin Automobile Company in April, 1920, and for standard equipment in November, 1920, and such use continued by Franklin until 1926. Indeed, we showed that Respondent's own witness admitted such use by Franklin as early as 1920. We further showed that the Long piston was replaced at Franklin in 1926, not by a Maynard piston, but by the steel strut piston, after the Trust had sued Long on the broad Spillman and Mooers patent, and after the Trust came into full potence.

Commercial Success Cannot Be Here Based Upon Licenses Under a Patent Pool.

Since no commercial use was shown by a piston of either of the Gulick or Maynard patents, the sole basis of commercial success of these patents must, therefore, be based upon the acceptance of licenses from, and the payment of royalties to, the title holder of a pool of eighty odd patents. But the nature of these patents, the circumstances of their pooling and the relations of the licensees cannot form such a basis in this case. Respondent attempted to do so by an impressive showing of the amounts of royalties which had been paid into the Trust (Ex. 13, R. 1328) and then proclaimed that the Gulick and Maynard patents, that is, two of the eighty odd patents, were responsible for it all. Petitioners, therefore, by compelling the production of the licenses and evidence relating to the formation of the pool and its operation showed the circumstances previously set out in the Statement of the Case and which may be summarized as follows:

Perfection in 1924 of a pool of patents by Cleveland Trust Company and Aluminum Company of America; with the Trust Estate holding and acquiring (nominally) all piston structure patents, including the basic Spillman and Mooers, and Franquist patents, as well as the Gulick and Maynard patents and later the Schmiedeknecht patent (the prototype of the Maynard patent piston); with Aluminum Company holding and reserving for itself the basic patents on processes and molds for chill-casting aluminum pistons and even for the chill-cast aluminium pistons per se; with an exclusive license from the Trust Estate to Aluminum Company for aluminum pistons and with concurrent sublicenses and licenses by Aluminum Company, under the Trust-held patents and the Aluminum Company

patents, to a limited number of piston manufacturers; with concurrent acknowledgment of a totally different piston (controlled type-strut, Ex. AAA) as coming under the Trust-held patents; with suits even in 1923 by the Trust and Aluminum Company against Long and another piston manufacturer; and the final elimination of Long as a competitor in 1926.

As the Master said (R. 1183):

> "The plan of plaintiff and its licensees has been to control the market in the manufacture of aluminum pistons, and former competitors Bohn Aluminum & Brass and Kant-Skore became sub and collateral licensees."

Actually at the end of 1926 there was complete control of the aluminum piston business in Aluminum Company of America with its ownership of its own chill-cast piston molding patents and with its exclusive license to aluminum pistons under the Trust-held patents. This was the situation even before the issue of the Gulick and Maynard patents, for the then issued patents of the Trust, particularly the Franquist patent, pre-empted the piston structure field, while the patents of Aluminum Company pre-empted the piston casting field. These latter, according to Dr. Jeffries, really solved the aluminum piston problem (R. 91, 100, 144). The Franquist patent did not expire until 1932 and the Aluminum Company patents did not expire until 1936. Even the Schmiedeknecht patent, which is really the prototype of the Maynard piston, did not expire until 1935.

From the above, it will be apparent that not only were the various licensees and sublicensees bound together by at least two-field ties, but there was nothing to show that

commercial success can be attributed to any two particular patents of the Trust, namely, the Gulick and Maynard patents, neither of which went into commercial use, and that no effect can be given to the licenses taken by these bound-together licensees under the Gulick and Maynard patents. The Master applied the proper rule when he said (R. 1184):

> "Until their expiration, plaintiff could rely upon the Spillman & Mooers and Franquist patents, and that piston manufacturers did not contest is no criterion of validity, for even the value and general use of a device will not sustain a patent if the lack of invention is clear. Of a situation not unlike that presented here, with the trustee owning many piston patents, Mr. Justice Holmes of the Supreme Court, in the recent Mineral Separation v. Magma Copper, 280 U. S. 400 (1930), says at page 404:
>
> > "'The petitioner adverts to the success that has attended the later patent and to the fact that the world waited until it appeared. But interlopers naturally would be slow to venture into the field occupied by a powerful company armed with Patent No. 835,120 and supported by a subtle ingenuity that we cannot doubt would have been exercised with even more effect to show that a process like that in No. 962,078 was an infringement than it now is to prove that the latter patent was a revelation that transformed the art.'"

The sum and substance of the evidence offered in connection with alleged commercial success was that the only recognition that had been given to the Maynard and Gulick patents was either of the "strong hands" type, Mineral Separation v. Magma Copper, supra, and Textile Machine Works v. Louis Hirsch Textile Machines, 301

U. S. 680, 57 Sup. Ct. 944, or of the "selfish" type discussed by Judge Tuttle in Oxford Varnish Corporation v. General Motors, 23 F. Sup. 562.

But respondent has in the courts below attempted to escape the effect of these decisions by contending that the inventions of the Spillman & Mooers and Franquist patents—after they had expired—were of no commercial utility, even to the extent of saying that the Franquist piston was "probably worse than a trunk piston" (R. 247) and "just plain no good" (R. 1043). However, this contention can be given little, if any, effect, in view of the fact, as pointed out in the Statement of the Case, that respondent, prior to the expiration of these patents, represented that they were responsible for the success of aluminum pistons, issued licenses thereon, collected royalties, brought suits, recovered judgments and, even as late as 1933, sought to have the decree in a suit in which they had recovered a judgment expanded so as to cover a piston identical with Exhibit 1. The Master discussed the evidence and the authorities (R. 1120-24) and properly came to the conclusion that respondent's attempt to renounce and denounce the Franquist patent could not be accepted, and that Exhibit 1 was based upon the now expired Franquist patent as respondent had previously contended and not on the Gulick and Maynard patents.

There has been no commercial success of anything described by Gulick or Maynard but of something discovered by Franquist in 1915, who, as stated by the Master (R. 1119), first disclosed "the conditions, fundamental means to meet those conditions, operation and results" of a practical piston, and whose disclosure has been followed by Exhibit 1. Upon expiration of that patent in 1932, that piston became free to the public to use. Even

in the specific form of Exhibit 1, it certainly became free in 1935, when the Schmiedeknecht patent expired. As will be seen from the last page of the Appendix, Exhibit 1 is simply the piston illustrated in the expired Schmiedeknecht patent, provided with the T-slot of Long, following the disclosure of Franquist, and having a Keystone relief not disclosed in either the Gulick or Maynard patents. Respondent could not by a device of pooling patents, first make use of, and after expiration of successive patents of the pool renounce them successively and transfer the claim of commercial success to later patents of the pool.

Point IV.

THE CIRCUIT COURT OF APPEALS WAS NOT JUSTIFIED IN CONCLUDING THAT THE PRESUMPTION RAISED BY THE DECISIONS IN THE INTERFERENCES INVOLVING THE APPLICATION OF THE GULICK PATENT HAD NOT BEEN OVERCOME BY CLEAR AND COGENT EVIDENCE, AND IT ERRED IN OVERRULING THE MASTER AND THE DISTRICT JUDGE IN THESE RESPECTS.

The Circuit Court of Appeals considered that because of the interferences in which the application of the Gulick patent had been involved, that it "should not be stricken down except upon very clear and convincing proof of invalidity" (R. 2388). It relied upon what this Court said in **Radio Corp. v. Radio Engrg. Labs.**, 293 U. S. 1, 2. In that case this Court was dealing with a patent which had issued after a protracted interference contest in the Patent Office and the Courts. This Court there said that such a patent had a presumption of validity "not to be overthrown except by clear and cogent evidence" (293 U. S. 2).

The District Court (R. 1229) considered that decision but decided that the presumption had been overcome. The Master refused to follow the decisions of the administrative tribunals approving the radical amendments made in the Gulick application because: first, the legal basis upon which these decisions were predicated was not sufficient in view of this Court's decisions in Permutit v. Graver, 283 U. S. 524; Powers-Kennedy v. Concrete, 282 U. S. 175; second, because the factual basis of those decisions had been dissipated by the evidence in these causes, particularly by the testimony of respondents' own witness, Dr. Jeffries.

The Court of Appeals simply agreed with and followed the decisions of those administrative tribunals (R. 2391) and in doing so went directly contrary to the decisions of this court.

The evidence in this cause is "clear and cogent" and the Court of Appeals, therefore, erred in overruling the Master and the District Judge. That evidence has been considered under Point I and need, therefore, not be further considered.

Moreover, the evidence is uncontradicted that in the Gulick application, as filed, there was no reference to laterally flexible webs, and the justification for reading them into the case relied upon by the Patent Office tribunals, the administrative courts, and the Circuit Court of Appeals was that this feature was found inherently from the drawings. The amendments which the Patent Office permitted to be made in this respect to the Gulick application were inserted long after intervening rights had arisen. The question presented, therefore, was whether a laterally flexible web which was considered by all of the courts and the Patent Office tribunals to be an essential element of

the patent could legally be considered as a part of the invention disclosed and claimed. This was a question of law to which, as we have previously endeavored to demonstrate, the decisions of this Court in **Permutit v. Graver**, supra, and **Powers-Kennedy v. Concrete**, supra, required a negative answer. The question was not whether invalidity was shown "by clear and cogent evidence," but whether, as a matter of law, a patent is valid which does not disclose, describe or discuss in its specification an element found to be essential.

CONCLUSION.

For the reasons stated, we urge that the Gulick and Maynard patents here in suit should be held invalid and that the decision of the Circuit Court of Appeals for the Sixth Circuit should be reversed.

Respectfully submitted,

THOMAS G. HAIGHT,
JOHN H. BRUNINGA,
JOHN H. SUTHERLAND,
Attorneys for Petitioners.

September 17, 1938.

APPENDIX.

Composite of Gulick Specification as Filed and as Amended.

(Cancellations shown by crossing out; additions by bold-face type.)

To Whom It May Concern:

Be it known that I, Edward J. Gulick, a citizen of the United States, and resident of Elkhart, Elkhart County, State of Indiana, have invented certain new and useful improvements in ~~Hydrocarbon Motors~~ Pistons of which the following is a specification:

1.

This invention relates to ~~hydrocarbon motors and particularly to~~ pistons ~~therefor~~.

One of the objects of the present invention is to provide a piston which is will not adapted to expand against the cylinder wall to such an extent as to ~~seize~~ cause or stick.

Another object of the invention is to provide a piston with a skirt or guide portion slightly separated from the head of the piston and split longitudinally so that it will not expand in circumference with a force great enough to cause the piston to stick in the cylinder.

Another object of the invention is to provide a piston with ~~improved lubricating means for lubricating conduits leading from the exterior of the piston~~ to the piston pin bosses.

Another object of the invention is to rigidly support the piston pin bosses of a piston from the piston walls against

mechanical load thrust from the connecting rod without interfering with the yielding characteristics of the skirt in response to cylinder wall pressure.

Other objects of the invention will appear from the following description taken in connection with the drawings which form a part of this specification, and in which:

Fig. 1 is a longitudinal sectional view through a piston embodying the invention;

Fig. 2 is similar to Fig. 1 taken at right angles thereto, being on the line 2-2 of Fig. 3;

Fig. 3 is a transverse section substantially on the line 3-3 of Fig. 1;

Fig. 4 is a transverse section on the line 4-4 of Fig. 1;

2.

Fig. 5 is a view similar to Fig. 1, showing a slightly different form of piston embodying the invention; and

Fig. 6 is a top view of the piston shown in Fig. 5.

Referring to the drawings, 10 represents the head portion of a piston and 11 is the skirt or guide portion which is shown as separated at its periphery from the head leaving an annular slit or opening 12 therebetween. The head portion of the piston is provided with an annular groove 13 for a piston ring 14, and the upper end of the skirt portion 11 is formed with a recess shown in the form of an annular groove 15 for the purpose of collecting the oil that may be scraped from the cylinder during the reciprocation of the piston.

The piston is also provided with a pair of separated piston pin bosses 16 which are formed with integral supporting flanges 17 extending around the bosses and ar-

ranged intermediate their ends. These flanges extend laterally of their respective bosses in the form of webs 18 which integrally connect with the wall of the skirt guide portion 11 as shown in the drawings. Since there are two of these webs or walls 18 for each of the bosses 16 there are therefore four connections of the webs 18 to the skirt or guide portion 11. These connections are in the four longitudinal lines as shown at 19.

The flanges 17 also extend upwardly from the bosses in the form of webs or walls 20 leading to the head 10 and thereby connecting the bosses with the head. Thus, the bosses are connected to both the head and the skirt so that the latter is held in its proper position directly beneath the head as shown in Figs. 1 and 2.

In order that the skirt may not expand an undue amount when the piston is heated, as under operating

3.

conditions, it the cylinder-engaging part of the guide at one side of the pin bosses which takes the angular thrust of the connecting rod during one stroke of the piston is split longitudinally as at 21. This split is slightly diagonal to prevent wearing a groove in the cylinder and it effects a complete severing of the guide wall so that the separated edges of the split are unrestrained for movement toward and from each other.

The piston is further provided with conduits 22 shown in the form of pipes extending from the recess or groove 15 at the upper end of the skirt to openings 23 in the bosses. There is shown one conduit for each boss and it will be understood that the oil collected in the groove 15 by the piston in its reciprocation is led down through the

conduits 22 to the interior of the piston pin boss to thereby lubricate the bearing.

The skirt 11 is formed with openings 24 in its side registering with the openings through the bosses 16 so that the piston pin may be inserted. As these openings are well above the bottom of the guide portion of the piston the lower end of the piston skirt is left unbroken, except for the split 21, and the arcuate parts of the skirt beneath said openings may be looked upon as joining the lower ends of the diametrically opposite cylinder-engaging parts of the guide that sustain the angular thrust of the connecting rod.

It will be seen that in addition to providing a piston with a split skirt, guide portion the above described construction also provides an extremely a longitudinally rigid connection between the piston pin bosses and the skirt guide portion of the piston, which construction may be used either with or without the split skirt guide portion and separated head. The arrangement of the supporting flanges 17 between the ends of the piston pin bosses and the connections of those flanges with both the piston skirt guide portion and the head provide a particularly strong support for the bosses construction, and at the same time, when the longitudinal split is used, as shown, the web structure has sufficient lateral flexibility to permit the split to close more or less under the action of the expansion forces incident to the heating of the piston.

In Figs. 5 and 6 the webs or walls 18 are slightly curved between the flanges 17 and the skirt wall guide portion to thereby distribute the connection of the bosses to the skirt guide portion more evenly around the skirt piston. Otherwise the showing is substantially the same as in the other figures. While my piston is, of course, adapted for

use in either vertical, inclined, or horizontal engines, for convenience I refer in some instances to its head end and its open end as the upper and lower ends or parts, respectively.

It will be understood further that my invention is not limited to the details of construction shown and other forms may be used without departing from the spirit or scope of the invention.

DRAWING OF GULICK PATENT.

July 21, 1931. E. J. GULICK 1,815,733

PISTON

Filed Nov. 30, 1927

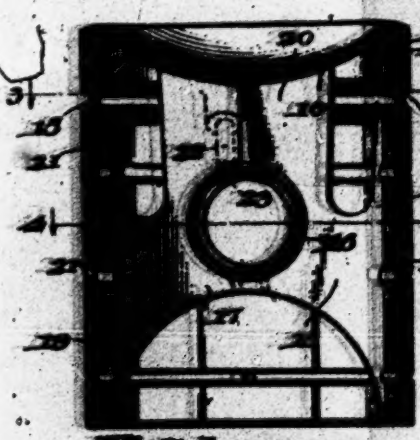


Fig. 1.

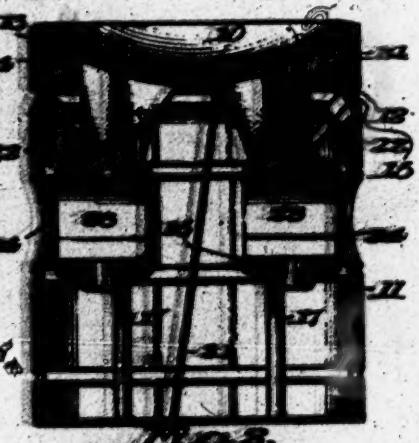


Fig. 2.

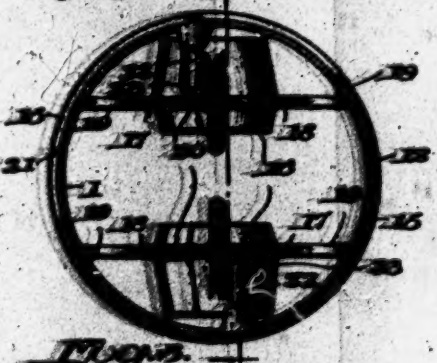


Fig. 3.

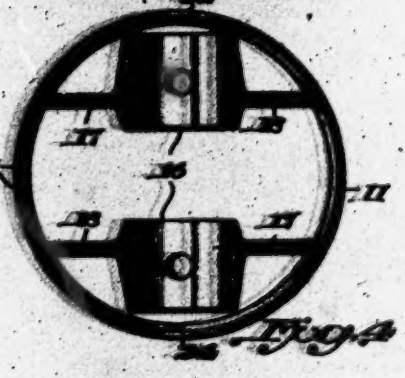


Fig. 4.

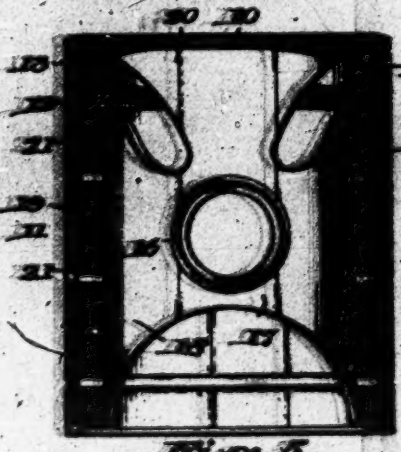


Fig. 5.

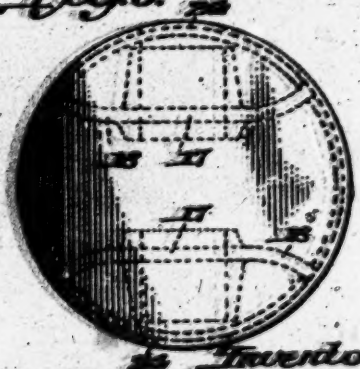


Fig. 6.

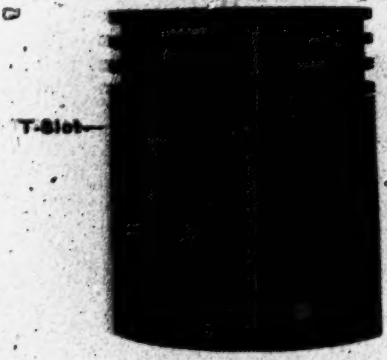
Inventor:
By Edward J. Gulick,
Miller & Prindle
Attys.

ILLUSTRATIONS OF PISTONS.

Exhibit 1
1923

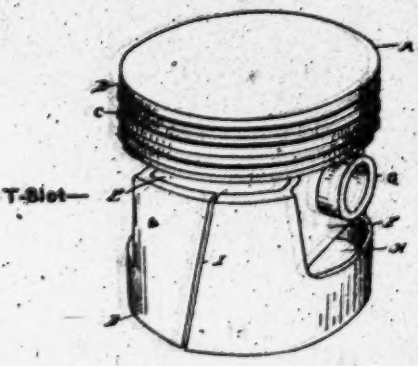
Franquist
1914

Long
1917-1926



chmiedeknecht
1917

Maynard
1921



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Supreme Court of the United States

October Term, 1938

THE SCHRAMM-SCHMIDT COMPANY, *Petitioner*, vs. THE CLEVELAND TRUST COMPANY, EXECUTOR, *Respondents.*	No. 3
THE AMERICAN MOTOR SUPPLY COMPANY, *Petitioner*, vs. THE CLEVELAND TRUST COMPANY, EXECUTOR, *Respondents.*	No. 4
THE F. E. BOWE SALES COMPANY, *Petitioner*, vs. THE CLEVELAND TRUST COMPANY, EXECUTOR, *Respondents.*	No. 5

PETITIONERS' REPLY BRIEF.

THOMAS G. HAIGHT,
JOHN H. BRUEMMER,
JOHN H. SUTHERLAND,
Counsel for Petitioners.

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IN THE

Supreme Court of the United States

October Term, 1938

THE SCHROEDER-SCHROTH COMPANY, *Petitioner*, vs. THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*	No. 3
THE ABERDEEN MOTOR SUPPLY COMPANY, *Petitioner*, vs. THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*	No. 4
THE F. E. ROWE SALES COMPANY, *Petitioner*, vs. THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*	No. 5

PETITIONERS' REPLY BRIEF.

Respondents' brief is divided into two sections, but they seem to cover exactly the same subject matter. We shall not attempt to answer these sections separately, but will answer the brief as a whole, with reference to the points in petitioners' brief.

Point I.

As we understand it, respondents' answer to petitioners' Point I is, (a) that the Court of Appeals did not hold that a flexible web was an essential element of the Gulick patent; (b) that the amendment which was made in the Gulick specification five years after it was filed and after the Long pistons came on the market was justified because of the alleged "inherent" lateral flexibility of the Gulick webs; (c) that the *dimensions* of the webs on the *drawings* of the Gulick patent, if followed, would produce webs laterally flexible; and (d) that the decisions of this Court in *Permutit* v. *Graver* and *Powers-Kennedy* v. *Concrete* are distinguishable from the case at bar. We will answer these propositions in the order in which we have stated them.

(1) As will be apparent from a reading of the opinion of the Circuit Court of Appeals, Gulick came into a crowded art. As the Circuit Court of Appeals said (R. 2385):

> "The Gulick patent is for a combination of elements, many, if not indeed *all of which*, are to be found in the prior art."*

The Circuit Court of Appeals then went on to describe the Gulick device and said:

> "That Spillman and Mooers patent 1,092,870, and Franquist patent 1,153,902, showed air gaps between piston head and skirt, or that splitting the piston skirt vertically or combining the vertical and longitudinal splits into the so-called T-slot were old practices, is not conclusive on the question of invention."

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* Where italics are used in quotations, it will be understood that the emphasis is ours unless otherwise noted.

In order that this statement may be understood, we pause to briefly describe these two prior art devices. The Spillman and Mooers piston had the head completely separated from the skirt just as in the Gulick patent. It provided the same means as in the Gulick patent for holding them together and supporting the wrist pin bosses. To quote the language of the Circuit Court of Appeals:

> "The wrist pin bosses are pulled inwardly from the skirt periphery, and instead of being supported by the skirt are carried from the piston head by depending flanges, thus providing a *vertically rigid* support for the bosses * * *."

A drawing of this piston will be found in R. Vol. III, p. 1684. A cross-section model is in evidence as Exhibit 3-P. This patent, however, did not disclose a vertical slit. The Franquist patent (R. Vol. III, p. 1688), a drawing of which appears in an appendix to our main brief, had four grooves or as the patent calls them "slots," which serve the same purpose as the slit and had two air gaps between the head and the skirt, exactly as in the *accused* device, and wrist pin bosses pulled inwardly from the skirt. A vertical slit, as found by the Master and conceded by the Circuit Court of Appeals, was old. The Master said (R. Vol. II, p. 1154):

> "Slotting through piston skirts was not only old, as shown by the Ebbs patent of 1902, the Van Bever, Rainforth and Serex patents of 1912 and the Vincent patent of 1913 * * *" etc.

The Serex patents (R. Vol. III, p. 1779) show a T-slot. The Circuit Court of Appeals then went on to describe and define the Gulick invention as follows (R. 2386):

> "To decelerate the flow of heat from piston head to skirt by an air gap was perhaps an obvious expedient

in the art.* To slit the skirt vertically so that pressure of the cylinder wall would compensate for thermal expansion was perhaps not beyond expected skill in the art.** Minute relief of the cylinder periphery in the region of the bosses was shown in Franquist.*** But to *combine* the insulation of head from skirt, retraction of the bosses from the skirt periphery, connection of such bosses to the skirt *with webs laterally flexible* and yet so carried from the head as to support the load upon the wrist pin with sufficient strength and rigidity, and to utilize the mechanical force of the cylinder wall upon the skirt and the thermal expansion of the bosses so as to compensate evenly and fully for head expansion and to secure a *balanced flexibility of the skirt* with no bending concentration at any point therein, discloses, we think, a meritorious concept beyond the reach of those skilled in the art."

We think it is apparent from the above quotation that the Circuit Court of Appeals considered that one of the main elements of the Gulick invention, if not the most important one, was "webs laterally flexible and yet so carried from the head as to support the load upon the wrist pin with sufficient strength and rigidity". That is the only element which the Circuit Court of Appeals did not refer to as either in the prior art or as within the expected skill of the art. Such a web was shown in the Spillman and Mooers patent although not described as laterally flexible.

* This, as previously shown, was not only obvious but was old in Spillman and Mooers and Franquist.

** This was old in the patents referred to in the part of the Master's report above quoted. In the interference proceedings involving the Gulick application, the Law Examiner was of the same opinion regarding the non-inventive character of splitting the skirt as the Circuit Court of Appeals (R. Vol. III, p. 1660).

*** The same relief as is in Gulick is shown in Spillman and Mooers.

It is, of course, a settled rule that all elements of the claims of a patent must be considered as essential and it certainly cannot be presumed that the Circuit Court of Appeals, when it referred to the flexible web as an "element" of the combination in which the invention of the patent was found, did not treat it as an *essential* element.

(2) The Circuit Court of Appeals rested its conclusion regarding the propriety of the amendment to the Gulick specification in respect to the webs upon two decisions in interference proceedings in which the Gulick application was involved (*Long* v. *Gulick*, 17 F. [2d] 687; C. A. D. C.; *Hartog* v. *Long* v. *Gulick*, 47 F. [2d] 365, 367, C. C. P. A.). In these cases it was contended that Gulick could not make the claims there involved. It was held that he could, the reasoning being that, in view of the slit in the skirt, the purpose of the invention would fail unless the webs were made to yield. In *Long* v. *Gulick*, the Court said in addition:

> "The *drawings of Gulick*, we think, clearly disclose the structure of the count."

The courts in those cases, and the Circuit Court of Appeals in the case at bar by adopting their reasoning, have therefore held that the web shown in the Gulick drawings must be inherently flexible, otherwise the slit would not work. But, as pointed out in our main brief,* respondents' expert in the case at bar testified that in order to procure flexibility, there "must be a correct proportioning of the different parts as to location and thickness" and that one "cannot rely upon the inherent flexibility of any given structure". Not only is there not a word in the specifications of the Gulick patent, as originally drawn, as to the lateral flexibility of the webs, but

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* P. 33.

as pointed out in our original brief, they were directly to the contrary. Respondents' brief not only controverts this proposition, but confuses the "webs" 18 here in issue with the "webs" 20.* The webs 20 are of cross formation and connect the bosses 16 to the head 10. It is through these webs 20 that the power is transmitted from the piston head to the bosses and then to the connecting rod.** It is these webs 20 that the Court of Appeals decision described as

> "providing a vertically rigid support for the bosses" (R. 2385).

But it is not the webs 20, but the webs 18 which connect the bosses with the skirt, and as to these the original specification stated (see appendix, petitioners' brief).

> "Another object of the invention is to *rigidly* support the piston pin *bosses* of a piston from the piston *walls*" (p. 53).
>
> "Provides an *extremely rigid* connection between the piston pin *bosses* and the *skirt*" (p. 53).
>
> "Provide a particularly strong support for the bosses" (p. 56).

It is these webs 18 which were by the amendment described as having "lateral flexibility", and it is these webs 18 which the Court of Appeals decided permitted the bosses to have

> "freedom of *lateral motion* in a direction at right angles to the thrust of the piston" (R. 2385)

and constituted a

> "connection of such bosses to the skirt of the piston with webs *laterally flexible*" (R. 2386).

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* See drawing in Appendix, p. 59, petitioners' brief.
** See illustration, respondents' brief, p. 43.

We therefore find that the "inherent flexibility" upon which the District of Columbia Courts and the Court of Appeals relied is (a) diametrically opposed to the statement in the Gulick specification as originally drawn; (b) it cannot, according to the respondents' own witness, be relied upon; and (c) it depends entirely upon circular reasoning, *i. e.*, that if the webs were not flexible, the purpose of the invention would be defeated. This reasoning proceeds from a generic statement of a desired result to a specific statement of structure for producing such result. It might be that the skirt would contract at some place, but it would not follow that a particular part inside of the skirt, namely, a web, would flex laterally, particularly when the original specification stated that the web was to be "extremely rigid".

It is not proper to make out a disclosure under R. S. 4888 by speculation and deduction. A like argument was advanced in *Permutit* v. *Graver*. The argument was that because the patent described a stirer for the zeolites within the container, that this showed that a "free" as distinguished from a "locked" bed was disclosed, because as the Court of Appeals in that case said "this feature was necessarily presupposed"; and further, that the patentee need not describe nor understand "a certain theory of operation" of a structure in the specification and drawings. But this Court said (284 U. S. 59):

> "We think that these views rest upon misconception."

So here, in the Gulick original application the mere presence of a vertical split in the skirt, even if described as such, cannot be relied upon as disclosing "webs laterally flexible"—that "this feature was necessarily presupposed"

—certainly not when the original description was exactly the opposite, namely "an extremely rigid connection".

This Court further said (pp. 59-60):

> "But there is no suggestion on the drawing or elsewhere that the upper plate bearing the layer of sand or quartz has any purpose except to serve as a mechanical filter through which 'the water to be softened may be first filtered', or that the unoccupied space has any other purpose than that of similar spaces in sand filters long familiar."

So here, there is no suggestion in the drawing or elsewhere that the webs connecting the wrist pin bosses with the skirt had any other purpose than similar webs in pistons long familiar, namely, the webs of the Spillman and Mooers patent.*

The question is—what was the invention with which Gulick came into the Patent Office? Of course, the best answer is his description in his specification.

(3) Respondent says that one can follow the dimensions on the drawings of the Gulick patent and secure "webs laterally flexible", and that it is common for engineers to work from drawings. In the first place, this Court held in *Permutit* v. *Graver* that drawings cannot supply a deficiency in the specification. But, apart from that rule, this is not a case where the description in the original specification was silent and the drawing was one stated to be of actual dimen-

* The Master's finding 11 (R. 1098) is to this effect. See also his Report (R. 1155). This Spillman and Mooers patent was included in a suit against Sterling's customer, Simmons, resulting in a decree holding a piston like Exhibit 1 infringing this Spillman and Mooers patent, which Exhibit 1 was found by the Court of Appeals to infringe the Gulick and also the Maynard patent.

sions, so that those skilled in the art were told to follow the dimensions given. The drawings were conventional patent drawings which were not stated to be dimensional and which could not be legally considered as such. The specification did not even state whether the piston is to be of aluminum,* or of cast iron, or of steel,** although, these are different metals and require different dimensions. For that reason the drawings could not be relied upon where the specification is silent.

In order to show this Court the difference between a patent drawing giving no dimensions and an engineering drawing with its complete data, reference is first had to Plaintiff's Exhibit 21 (R. 1337). This is an actual engineering drawing of a piston, indeed probably the first engineering drawing of a piston of the Maynard patent. The first thing we see is dimensions in utmost detail with directions to take them at a "temperature of 70° Fahrenheit", and with the definite warning "NOTE—DO NOT SCALE THIS BLUE PRINT", which latter, of course, means do not pay any attention to the thicknesses and sizes delineated on the drawings, but strictly follow the dimensions indicated. Moreover, the nature of the material is given as "LYNITE" which is an aluminum alloy. Now in spite of all the pains that was taken in Exhibit 21, this piston apparently would not work, for no sale of a single piston has been shown (see discussion, petitioner's brief, pp. 40-41). We, therefore, next find Exhibit 22 (R. 1339) with a Keystone relief added at (H) with the notation "their wire". Here we find in addition

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* Plaintiff's expert Dr. Jeffries admits that there is no disclosure in the Gulick patent, even as issued, that the piston is to be made of aluminum (R. 137).

** In 1917 pistons were made of cast iron (Schmiedeknecht R. 1306), and even of steel (Pugh R. 1744).

to the dimensions and warning given on Exhibit 21 also a specified "HARDNESS".

This should satisfy this Court that the drawing of the Gulick application was not a drawing on which any engineer would or could rely.

Respondents also contend that because the original Gulick application used the word "web" (even though originally described as "extremely rigid"), the application could be amended to describe the same web as "laterally flexible", because that was a "property" or something "inherent" in any "web". A dictionary definition of "web" (brief, p. 5) is given. What respondent has done was to quote the favorable and unanalogous definitions, and not the analogous ones which are the following, taken from a later edition of Webster's Universal Dictionary of 1937:

> "(d) the plate or its equivalent in a beam or girder which connects the upper and lower flat or laterally extending plates (fig. b); (e) the corresponding portion of a rail between the tread and foot (fig. e); (f) the flat portion of a wheel, as of a railway-carriage, between the nave and the rim, occupying the space where spokes would be in an ordinary wheel (fig. a); (h) that portion of an anvil which is of reduced size below the head; (j) the arm of a crank extending from the wrist to the shaft."

We are dealing here with a piston which is a machine structure analogous to a beam, rail or a crank, in which piston the web was described as "extremely rigid".

We have not here a web, but a piston having a web. Inherently such a web may be flexible, but again it may not be flexible under the forces permissible to prevent seizure of the piston in the cylinder. When it is therefore described as extremely rigid, it naturally means that it is rigid and

not flexible under the conditions to be ordinarily encountered.*

When, therefore, Gulick originally described the web of the piston as being "extremely rigid" those skilled in the art were told that it was to be made of such dimensions as to be rigid under the pressures permissibly active upon it in a cylinder. To so function it had a definite mode of operation by virtue of the rigidity of the web. When the specification was therefore amended to describe the web as "laterally flexible", there was introduced not only another structure, but another mode of operation.

This case, therefore, does not involve the disclosure of an element with an amendment describing the inherent property of that element as contended by respondents' counsel. The element originally described was not simply a "web", but "an extremely rigid" web, and by amendment this was

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*The above explains the statements by both Jeffries and Stellman quoted in respondents' brief (p. 32). Both were considering inherent flexibility. Stellman was, of course, "looking at the drawings", but he had qualified his statement quoted by respondents' counsel by testifying (R. 568):

"Q. Anybody understanding pistons and skilled in the piston art would know those webs would be flexible if made of the material of which pistons are ordinarily made? A. Yes, if they were not tied down in any way as shown in this piston."

Furthermore on redirect he testified:

"Q. Is it your idea that the expression 'extremely rigid' means the same as 'very flexible'? A. I should not think so, no.

"Q. As a matter of fact, those expressions are as wide apart as the poles, aren't they? A. Diametrically opposed, I should say" (R. 577).

* * * * * * *

"A. He describes a very rigid section between the wrist pin bosses and the skirt of the piston, designated by 17 and 18 in Fig. 4.

"Q. Would that convey to your mind that the structure was intended to be very flexible? A. No, sir, I should say that he intended that it should be rigid" (R. 578).

changed to a "laterally flexible" web. They are not the same element, but are different elements, indeed, they are diametrically different in essential structure, function and mode of operation.

Respondents' brief, proceeding on the assumption that a patent is a contract, draws the rather ridiculous analogy that if there was a contract for a cow, it would not be necessary to specify that the cow was to have various vital organs. The difficulty with this argument is that a patent, although in certain respects a contract, must nevertheless contain "a written description of the" invention, and "of the manner and process of making, constructing, compounding, and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound, and use the same" (§ 4888); and this Court has held that a deficiency of the specifications in any of the above respects may not be supplied by drawings (*Permutit* v. *Grover*).

(4) We have already shown how the decision in *Permutit* v. *Grover*, destroys the "inherent flexibility" argument, and, in our main brief, have pointed out that under that decision, the absence in the original specification of the element of lateral flexibility cannot be supplied by reference to the drawings on which respondents' expert relied. Respondents contend, however, that there is a difference between supplying an essential element of an invention which is missing in the specification of an issued patent and permitting an application to be thus amended in the Patent Office. We submit that there is no such difference when it is borne in mind that new matter can never be inserted in an appli-

cation.* As drawings may not be resorted to "where there is an entire absence of description of the alleged invention",** it was certainly new matter to insert in this application that the webs were laterally flexible, especially when they had been previously described as "extremely rigid". We have previously shown that the alleged "inherent flexibility" has no substantial basis. We submit, therefore, that it can make no difference, so far as the applicability of *Permutit* v. *Graver* is concerned, whether we are dealing with a pending application in the Patent Office or an issued patent.

Here as in *Powers-Kennedy* v. *Concrete Co.* the patentee lifted the finally claimed invention out of the application of the other man (Hartog). While Gulick was not in the Hartog-Pomeroy interference, respondent became familiar with the Hartog claim, as stated by respondent (R. 1875), and copied ("lifted") it (R. 1872). It is immaterial whether the Pomeroy application was then owned by Aluminum Company of America, although Jeffries shows that Pomeroy was then associated with that Company's predecessors (R. 185),

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*The rule is stated by the Circuit Court of Appeals for the Eighth Circuit in *Insulite Co.* v. *Reserve Supply Co.*, 60 F. (2d) 433, 435, as follows:

> "While it is permissible during the prosecution of an application for a patent, to make amendments to the specifications and claims, yet these amendments must be directed to the same invention as originally disclosed, rather than to new matter".

In *Gardner* v. *Herz*, 118 U. S. 180, this Court held, to quote from the syllabus:

> "The suggestion in the second reissue, that 'the seat is adapted to be secured to any chair frame, as it is easily cut and fitted to the same', not being found in the original patent or in the first reissue, is new matter, and does not confer patentability on the article. No ground for patentability can be derived from the insertion of such matter in suggestions in the second reissue".

** *Permutit* v. *Graver*, 284 U. S. 60.

and it is a fact that the Pomeroy patent thereafter issued to respondent (R. 1803). Long was actively adverse from 1917 to at least April, 1924, when the trust estate was formed, after which, probably 1926, he stopped making pistons, as the trust estate then had the broad Spillman & Mooers and Franquist patents and had sued Long on the former (petitioner's brief, p. 7).

There were intervening rights of Long and Hartog, by the latter exactly as in the *Powers-Kennedy* case, where the MacMichael interests had purchased the Leake application, and both patents were issued to the MacMichael interests (see petitioners' brief, p. 25). The fact that petitioner was not involved is immaterial because in a situation involving adverse rights, the adverse rights of the general public are paramount, *Macbeth Evans Co.* v. *General Electric Co.*, 231 F. 183, 189 (Affd. 246 F. 695, C. C. A.—6), cited with approval by this Court in *Woodbridge* v. *United States*, 263 U. S. 50. Indeed it was really so held by this Court in the *Powers-Kennedy* case.

Respondents' counsel also says that no broadening took place, because claim 1 as filed was broader than what the Court of Appeals found was the invention of the Gulick patent.

Of course, if the flexible web was an essential element of the patent as the Circuit Court of Appeals held, it must be read into claim 1, for it is perfectly clear from the Court of Appeals decision that claim 1, without that element, would have been held invalid. It contains only the very elements which the Court of Appeals said would not involve invention over the prior art. But we are not concerned with whether there was a broadening of the invention or not. Rather the question is whether an essential element of a combination which the Court of Appeals held constituted patentable in-

vention was described in the original application in such a way that it could be *specifically* added, even when apparently contrary to the original disclosure, five years after another device containing all of the elements of the combination was on the market. *Powers-Kennedy* v. *Concrete*, and the cases which it followed, we submit, require a negative answer.

We are not concerned here with a broadening of any claim so as to include a piston having no web, because the Court of Appeals held that pistons which did not include any web, even though including a T-slot, did not infringe either the Gulick or the Maynard patents (R. 2394).

Point II.

Respondents attempt to answer our Point II by taking issue with our contention that the Court of Appeals found flexible webs an essential element of the Maynard patent. This respondents attempt to do by laying emphasis on the words "the regions of the wrist pin bosses". The language used by the Circuit Court of Appeals was "flexible webs in the region of the wrist pin bosses". This was but another way of saying "webs laterally flexible". The Court of Appeals said (the full quotation being on page 36 of our main brief) that the Maynard patent embodied the Gulick combination, one element of which was webs laterally flexible. Again it said:

> "It is clear that Maynard, while not departing from the teaching of Gulick in *basic combination of elements*, discloses a piston lighter and more economical of manufacture than Gulick and one more rugged and durable than Jardine" (R. 2393).

The invention over Gulick and Jardine was apparently found in *details* of construction, but one of the essential elements was the laterally flexible webs; necessarily so because of the prior Franquist, Schmiedeknecht and Long pistons (see our main brief). As these webs are neither described in the specifications nor mentioned in the claims, and can only be found by reference to the drawings or by reason of the "inherency" argument which we have discussed in connection with the Gulick patent, it follows that the Maynard patent is invalid under § 4888 in the light of *Permutit* v. *Graver*.

Petitioner's expert Stellman did not admit "extensive commercial use of the precise piston illustrated in the drawings of the Maynard patent" as stated by respondents (brief p. 49). He testified as to "general design" of such pistons, not the "precise piston". We have shown that no piston like Exhibit 1 was on the market that did not have the Keystone relief. Respondents' drawing of the Maynard patent piston (brief p. 52) does not show the Keystone relief and the Master found (R. 1162) that the Maynard patent did not disclose it in either the specification or the drawing, and this is based on the admission of respondents' expert Jeffries (R. pp. 130, 225). Indeed, the Keystone relief was not put on the piston until 1925, four years after Maynard filed (Exhibit 22, Vol. III, p. 1339).

Point III.

The Long pistons are belittled by respondents' counsel in spite of the fact that they were the only pistons compensating for expansion in commercial use before 1923 when the alleged piston of the Maynard patent is supposed to have first appeared. We do not have to rely upon any of

petitioners' evidence for this, because we have the testimony of respondents' own witness that they were in commercial use in the Franklin automobile as early as 1920 (see petitioner's brief, p. 45).

Not only were these pistons in use in the Franklin automobile, but they were in use in the replacement trade, in addition to Franklin automobiles in the Oldsmobile, Northway, Ford, Essex, Dusenberg and Reo (R. 392 and 412), and exhibits (R. 1613, 1615, 1617 and 1619). The Franklin engine was the worst possible engine that an aluminum piston could be used in, because it was air cooled, and Stellman shows that (R. 458). Furthermore, the Long piston was not replaced in 1926 by any piston of the Maynard patent, or even by Exhibit 1 having the Keystone relief, but by a strut piston (see petitioners' brief, p. 45).

What Should Be Remanded to the Court Below for Decision.

Respondents contend (Br. p. 77) that if this Court should reverse the Court of Appeals, it should remit to that Court for decision the questions arising upon the patents in suit other than Gulick and Maynard, as well as certain claims of the latter patents. If it is proper to remit to the Court of Appeals for decision the questions in respect to the patents not passed upon, even though the Court of Appeals apparently considered them of little worth (see our main brief, p. 4), we submit that respondents should not be afforded another opportunity to have the Court of Appeals pass upon other claims of the Gulick and Maynard patents than those specifically referred to in the mandate (R. p. 2379). In the first place, the Circuit Court of Appeals' holding as to what constituted invention in both

patents necessarily requires the reading into all of the claims of each patent "webs laterally flexible". In the second place, respondents picked out for the Court of Appeals certain example or typical claims for it to pass upon (see petitioners' brief in Court below, p. 74). *Great Northern Co.* v. *General Electric Signal Co.*, 57 F. (2d) 457, 461-462 (C. C. A. 8th, Cert. den. 283 U. S. 895).

Respectfully submitted,

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In the Supreme Court of the United States

OCTOBER TERM, 1937.

THE SCHRIBER-SCHROTH COMPANY,
Petitioner,
vs.
THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.
No. 674.

THE ABERDEEN MOTOR SUPPLY COMPANY,
Petitioner,
vs.
THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.
No. 675.

THE F. E. ROWE SALES COMPANY,
Petitioner,
vs.
THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.
No. 676.

BRIEF OF RESPONDENTS ON THE PETITION FOR CERTIORARI.

It is manifest from the "Specification of Errors" (pp. 15 and 16 of the Petition) that the rule applicable in the instant case was stated by this Court in *Keller v. Adams-Campbell*, 264 U. S. 314, 319, 320, as follows:

> "Such an ordinary patent case, with the usual issues of invention, breadth of claims, and noninfringement,

this court will not bring here by certiorari unless it be necessary to reconcile decisions of circuit courts of appeal on the same patent. We therefore find ourselves mistaken in assuming that an important issue of general patent law under Sec. 4916, Rev. Stat. (Comp. Stat. Sec. 9461, 7 Fed. Stat. Anno. 2d ed. p. 211), is here involved. The result is that an order must be entered dismissing the writ of certiorari as improvidently granted, at the costs of the petitioner. *Layne & B. Corp. v. Western Well Works*, 261 U. S. 387, 67 L. ed. 712, 43 Sup. Ct. Rep. 422; *Furness, W. & Co. v. Yang-Tsze Inc. Asso.*, 242 U. S. 430, 61 L. ed. 409, 37 Sup. Ct. Rep. 141; *United States v. Rimer*, 220 U. S. 547, 55 L. ed. 578, 31 Sup. Ct. Rep. 596."

(1) The Decisions of the Courts of Appeals are in Harmony in the Instant Cause (92 Fed. (2) 330 (C. C. A. 6); 17 Fed. (2) 686 (C. A. D. C.); 47 Fed. (2) 365, 366, 367 (C. C. P. A.)): In the 17 Federal (2) and in the 47 Federal (2) cases all the lower tribunals were shown to be in accord with the appellate courts; little weight can be given the decision of the District Court in the instant cause because, the Court of Appeals said that to do so "may prove to be an unsafe guide to just decision where exceptions to a Master's report are unilluminated by oral argument and a decree entered without elucidation of the reasons upon which it is based." (R. p. 2389.) Where the Master differed from these appellate Courts, the differences were differences in law. It is extremely doubtful whether it is correct to say that the Master is in discord with all of these other Courts since his holding was not that Gulick had broadened his disclosure, but only that he had made an "attempt" to do so; all the other tribunals—except, of course, the District Judge—have held that Gulick had not broadened his disclosure. Unless, therefore, this finding of the Master of an "attempt" to do something be construed to be the doing of that thing, the Master and the District Judge are not in discord with the three Courts of Appeals.

(2) No Public Interest: There is even less public interest in the instant cause than in the ordinary patent infringement cause such as *Keller v. Adams, supra*, or any number of other patent causes certiorari in which are denied monthly.

Of the seven devices charged to infringe, but one was specifically held by the Court of Appeals to infringe. In other proceedings Petitioners contend that the Court of Appeals held that the other six did not infringe. Three licenses have been granted under the patents in suit and the three licensees have always been and are prepared to supply all the public's needs for the patented pistons at reasonable prices. Many other kinds and types of pistons are available to the public; some of these were never patented and on many others the patents have expired. Among these are the Franquist and Spillman, *et al.* patents which Petitioners praise so highly and to which Petitioners attach so much importance. Many motor makers, such as The Ford Motor Company and General Motors Corporation, are using non-infringing pistons in many of their cars.

The alleged public interest urged by Sterling Products Corporation, here in the stead of the Petitioners, is no more than a desire of Sterling to be permitted to continue to duplicate, even to their most minute details, the various piston structures patented by Respondent, just as Sterling has been duplicating such structures from time to time in the past as they have been invented, patented and marketed by Respondent and its licensees. (R. pp. 84, 129, 130 and 1327.)

Alleged Pooling of Patents: As in this Court, the Petitioners in the Court of Appeals pressed, with many repetitions, its claim of "patent pool," but the Court of Appeals said no more than that the Respondent "is the

repository of numerous patent rights assigned to it by inventors" and others (R. p. 2383); it is not, therefore, a patent pool even to the extent of the grouping of patents found *legal* by this Court in the *Oil Cracking* case, 283 U. S. 163. Owing to the numerous defenses that may be interposed in a patent suit—such as was done here (R. p. 2384)—and to the need of references to Masters due to overworked District Judges, individual inventors cannot meet the expenses of such records as that of the instant suit. Hence, they have united their interests, just as others such as workingmen, stockholders, etc. are doing to meet modern conditions; that is all that has been done here and it is for, and not against, public policy, since it provides inventors a way to realize remedies which the public intended they should have and of which they would, otherwise, be deprived by the longer purse of the infringers.

The issue of "patent pooling" is not raised by the pleadings here, and is not an issue that can be raised in a patent infringement suit. (*Trico v. E. A. Laboratories*, 49 Fed. (2) 404, 405; *Andrea, Inc. v. Radio*, 14 Fed. Sup. 226.) If the Petitioner is aggrieved, the Anti-Trust Laws provide him with a way of asking for relief either by going to the Courts or inducing the Department of Justice to do so. The Department of Justice is now investigating the Respondent's "repository of patents" and, if any wrong has been done no doubt the issue of "pooling" will be dealt with before the proper tribunals, in the proper manner and on issues properly made, etc. It would seem that reliance could be placed upon the Department of Justice to deal with the question of pooling, if there is any such question here. Manifestly, that question is presented here for no other reason than a hope that the Court may be led into considering an issue not before the Court.

For the same reason, frequent reference is made to the Aluminum Company of America, who is one of the

licensees under the patents in suit; counsel drag in the most immaterial and remote matters such as the Pomeroy interference* in order to drag in the name of the Aluminum Company. We note from the public press and from reported Court decisions, that the Aluminum Company is being investigated by the Department of Justice, and that should suffice.

(3) Litigation in a Single Circuit: Respondent instituted a suit on the patents here involved in Brooklyn, New York, in the Second Circuit, to get an adjudication in another Circuit than the Sixth Circuit on a piston made by the E. M. Smith Corporation of Los Angeles, California, but Sterling Products Corporation of St. Louis, Missouri, who is conducting the proceedings in the instant suit, connived to have that suit go by default; Sterling also left the Eighth Circuit and came into the Sixth Circuit to submit to the jurisdiction of the Courts here, so that Petitioners can hardly complain if the pending litigation is confined to the Sixth Circuit, since they, and not Respondent, are responsible therefor.

Most of the pistons are made and sold by others than motor manufacturers, so that it is unimportant that most of the motor makers are located in the Sixth Circuit.

The Petitioners duplicated the piston shown in the drawing of the Maynard patent, as others have done in other Circuits than the Sixth, but there has been no time to institute suit against any of these since the mandate came down in the instant causes and no need to do so, until it can be determined whether such infringements will cease without suit. We assume that we may, and should properly, await the termination of a test case in one Cir-

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* The Aluminum Company had nothing to do with this interference; it was fought and terminated before the Aluminum Company bought the Pomeroy application.

cuit before we proceed to duplicate litigation in other Circuits; likewise, that we may withhold litigation until others have had reasonable time to conform to the rulings of the Court of Appeals in the Sixth Circuit. Moreover, we do not have here a case where the only ruling upon the matter urged is, and always must be, the ruling of one Court of Appeals, since, as we have said, two Courts of Appeals other than the Sixth Circuit Court of Appeals have each decided in favor of the Respondent on the only "error," which Petitioners claim the Court of Appeals made which could be controlling.

The "Specification of Errors" are four in number. The only one which is urged as controlling is the first. The second and third relate to cumulative matters only and the fourth is formal.

The "First Specification of Error" relied upon for the petition, and the specific error said to have been committed by the three Appellate Courts, and all the tribunals lower to two of them, is an error of law and in fact.

The Law Phase: It is true that a patentee is required to disclose in his patent and in his claim *the elements* of his machine—where his invention is a machine—but it is equally true that he is not required *to describe all the properties of those elements.* (*Eames v. Andrews,* 122 U. S. 40, 56.) When Gulick and Maynard described the *webs* in their specifications that was all that was required of them; they were not required to describe the properties of the webs such as flexibility, hardness, high coefficient of melting point, durability, resiliency, and all the other properties of piston metals. Manifestly, to include in a patent disclosure a description of all properties of all elements and of all the materials of which they are made would make patent claims

and descriptions endless. This Court did not, in *Permutit v. Graver,* in *Powers-Kennedy v. Concrete,* or in any other decision, so hold; neither has any other Court in any other decision so held. The law is, and must needs be, to the contrary; the contrary is the rule in this Court and in all the Circuits (*Eames v. Andrews, supra*; *Diamond v. Consolidated,* 220 U. S. 428, 436; *Jackson v. Peerless,* 228 Fed. 691, 693 (C. C. A. 6); *U. S. Ozone v. U. S. Ozone,* 62 Fed. (2) 881, 890 (C. C. A. 7); *Hoskins v. G. E.,* 212 Fed. 422, 430, affirmed 224 Fed. 464 (C. C. A. 7); *Mead-Morrison v. Exter Mach.,* 225 Fed. 489, 496 (C. C. A. 3; *Novedel v. Meyer,* 35 Fed. (2) 697, 703 (C. C. A. 2); *National v. Interchangeable,* 106 Fed. 693 (C. C. A. 8).

Typical of the statements of these rules is that by Judge Sanborn, speaking for the Eighth Circuit Court of Appeals in *National v. Interchangeable,* and occurring at 106 Fed. 709:

> "It is true that Hein did not describe or claim, and it is possible that he was not aware of, the utility of *resilience in the beam* when he procured his first patent; but the law did not exact of him a statement or claim of the functions or uses of his combination,"

If counsel were correct, innumerable patents would be invalid on their face for few have ever so extended the description.

These properties are known to those skilled in the art to whom patents are addressed. Description in specification and claims, without naming all their properties, is sufficient to teach those skilled in the art and therefore is sufficient disclosure.

Moreover, if counsel were correct in their contention, or in their contention for what this Court meant in *Permutit v. Graver,* very commonly prior art, and especially that based upon public invention, public use, or the like, would be insufficient, since often there is no description at all of

such prior art except such as is found in models and drawings, and even where there are elaborate descriptions, the engineers or mechanics making such description seldom describe the properties of the materials of which prior art devices are made.

The expert for the Petitioners, as well as for the Respondent, testified that the webs would be flexible and anybody would know that they would be. Petitioners' expert said (R. p. 568):

> "That is, with your knowledge of the piston industry you would know by looking at the drawings (Gulick patent) that those webs would be flexible if the piston was made of material of which you ordinarily made pistons? A. Yes."

Respondent's expert testified (R. p. 201):

> "Q. Do you know of any metal of which internal combustion engine pistons are made or have been made which, employed in the construction of the piston illustrated in the drawings of the Gulick patent, would have webs that weren't flexible? A. No.
>
> "Q. State whether or not it would be possible in your opinion to make a piston out of any metal employed for making internal combustion engine pistons and conforming to the drawings of the Gulick patent, without having flexible webs? A. No, it would not be."

* * * * *

At Record page 150 he testified of Gulick:

> "Q. Oh, yes. A. Well, then, it is clear enough what he had in mind. These drawings are susceptible of no other interpretation, as I see it. 'You have got longitudinal rigidity and lateral flexibility.'"

(See also R. pp. 173 and 1006.*)

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* Thus counsel's repeated statement that Respondent's "expert testified that flexibility was not inherent in the web structure" (Petition, p. 19) is flatly contrary to the record and the evidence of both experts.

(Continued on page 9.)

In the *Permutit v. Graver* case, a filtering device was involved which included a filter bed composed of a plurality of grains of zeolite, or like material. The point of novelty of the apparatus consisted in providing a bed with a space above it and (for cleaning) such a current flowing up through it that these grains would be driven upward from the bed by the current, spread out by the current, and then allowed by such current to return to the bed in such a way that they would settle down in a new and different arrangement so as to rejuvinate the filter bed. As this Court said (284 U. S. 56) it was "necessary to have an open space above the top of the zeolites in order to furnish opportunity for the zeolites to rise or boil and to spread out

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The petition and briefs thereon are full of half statements and deductions, found erroneous when the record is carefully considered. Such are those in the footnote at the bottom of page 6 of the petition, for example, each of which is contrary to the above statements and to common knowledge. We cannot undertake to correct all of these misstatements and half statements, but will answer those at the bottom of page 6 of the Petition.

At page 229 of the record our expert said, in discussing the pistons including the Ricardo piston, that the flexibility of the web could not be depended upon. This is because the web of the Ricardo piston is so bound by other members that it cannot flex (R. p. 1718). That he was not talking about the Gulick, but was about the Ricardo, is clear from the following question and answer on page 228:

> "Q. And the distinction between the Ricardo piston and the Gulick piston is, again, that the Gulick webs are flexible and Ricardo's weren't made that way for flexibility; is that right? A. That is one of the distinctions; of course there are others."

His testimony at pages 149 and 150 was that Gulick "does have a rigid piston longitudinally, and a flexible piston laterally" which is what Gulick originally described. One of the difficulties encountered was the production of a piston which would be rigid vertically but flexible horizontally; that Gulick did and that he did describe in his original specification. Petitioners, as did those before the tribunals and Courts, undertook to change this description around and make it read rigid horizontally, without success in any of the three Courts of Appeals.

(Continued on page 10.)

and reform in the bed." Much more was necessary than a mere free space above the bed. This space had to cooperate with the currents which caused the grains to rise, mixed them up and permitted them to return in a new arrangement to the bed. This Court said (p. 59) "there is no suggestion *on the drawing or elsewhere*" of this operation and function. The most the claims recited in that connection was "a filter bed." Thus the feature which included structure, operation and results was not suggested in the *drawing, in the specification or in the claims* and, of course, the patent (of which this feature alone was new) was invalid for want of disclosure. Such a situation is a far cry from the one involved in the instant case where the web, its operations and what it does are all described and have always

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At page 154 our expert testified that the webs could be made non-flexing "if they are made one inch thick," but if you did "you haven't a practical piston at all." By leaving out these qualifications we assume the Petitioner hoped to have this Court believe that the witness was referring to the pistons of the patents in suit concerning which both experts had testified to the contrary, as we have quoted above.

The witness did not say that it was necessary to deliberately design the webs of Gulick to secure flexibility (at either page 156 or page 229 of the record). What he said was that these webs would be flexible in any event, but that deliberate design would, in considering different piston designs, secure the desired flexibility for any particular design but that in any event "*It happens, or it is a fact that the Gulick construction appears to flex a proper amount*" (R. p. 156). We have already pointed out that by the reference at page 229 it was the Ricardo piston and not the Gulick piston which the witness said, in distinguishing therefrom, had flexible webs.

Another one of these half statements, that is fertile with misguidance, occurs in the first footnote at the bottom of page 20 of the Petition. The reference to page 122 of the record there given shows that Dr. Jeffries testified that there were features other than the web which combined with the webs to compensate for the expansion at the top of the Maynard piston and that enough was present "to make the difference practically between success and failure of the piston." He did not say, as counsel contend on the basis of the testimony, that web flexibility was the difference between failure and success.

been described and illustrated in the patents. The complaint is that the patentees did not mention a property, i.e., flexibility of the webs which were known and understood and which both experts say was inherent in the material of the webs. It has always been the law that where a party did not suggest a thing in the drawing, the specification or the claims, the disclosure is insufficient. No new rule of law was made by this Court in *Permutit v. Graver*. It has likewise always been the law that a patentee is not required to describe all of the properties of the materials of which his elements are made. There is not only no conflict between the two rules, but no relation between them.

In *Permutit v. Graver*, the overruled decision of the Circuit Court of Appeals had found, in the drawings, a sufficient disclosure of the unstated "free and unconfined" space above the filter bed by reference to another part of the drawing, the stirrer, which, if operated as described, indicated the free and unconfined character of the top of the filter bed. This Court held that this was going too far in finding disclosure by a drawing. In the drawing of the filter bed itself, there was nothing to show that the top was free and unconfined; there might have been, as there had been in the earlier art, a close fitting cover perforated sufficiently for percolation but an obstruction to boiling up under a current from below.

In other words, the "free and unconfined" character of the top of the filter bed was not inherent in the filter bed structure shown by the drawing and in the operation of that structure as described in the specification, as the flexibility quality was in the Gulick structure as shown and described; but in the *Permutit* case this quality, instead of being inherent in the filter bed shown in the drawing, was to be inferred from the supposed operation of some other part of the structure shown in another part of the drawing.

Petitioners' contention for the interpretation of this Court's decision in *Permutit v. Graver* is not only contrary to the plain language of that decision but, if accepted, would place that decision contrary to the statutes, the practice for more than one hundred years and plain common sense. Although it is a moot question here, the statute requires a single and not a double disclosure. It is common knowledge that engineers and others skilled in the arts, including that to which pistons relate, make their disclosures through drawings hundreds of times where they make disclosures through descriptions once. The drawings are clearer and more accurate in describing than words are or can ever be; the drawings can be understood more quickly than the words; they are also less ambiguous than the words. For anybody to say that these drawings do not disclose the devices depicted in them to those skilled in the art is to say what is not true, because they do, to common knowledge.

If the rule were as Petitioners contend this Court said it was in *Permutit v. Graver*, then much of the prior art which is cited and relied upon in this case and has been relied upon in other cases, often to invalidate patents, would be impertinent, because it is rare that cases of prior invention, prior use, or the like, are established by any other descriptive matter than drawings or models. In better words, it is very rare indeed to find a contemporaneous written description of a prior device, except where it is patented or described in a printed publication, and then one never finds a description so complete as to recite all of the known properties of the elements and the materials employed, as Petitioners say was necessary under this Court's holding in *Permutit v. Graver*.

Nor is there any such conflict between the decisions in the Sixth Circuit Court of Appeals and in the other Circuits as counsel state on page 9 of the Petition. In the two Sixth Circuit cases cited, the Sixth Circuit Court of Ap-

peals said that it did not understand that the general and ancient rule that resort may be had to the drawings and specifications to interpret the claims was affected by this Court's decision in *Permutit v. Graver* and, of course, it was not. This rule is older than the patent law and comes from the rule that where the terms of a contract are ambiguous, resort might be had to collateral matter to clear up the ambiguity. Certainly, if drawings were available which did clear up such ambiguities, they would be available under the general rule. Petitioner's contention that all of this has been changed by this Court's decision in *Permutit v. Graver* is manifestly unsound.

In the cases from the other Circuits which counsel has cited and sought to place in opposition to the decisions in the Sixth Circuit Court of Appeals, the Courts in the other Circuits were merely following the well established rule that where there was insufficiency of disclosure, such as was the case in *Permutit v. Graver,* the patents were invalid for that reason.

Counsel cite too many such cases for us to analyze each one of them; counsel quote from one only of them, i.e., *Helfrich v. Solo,* 59 Fed. (2) 525 (C. C. A. 7). The matter quoted means nothing. The facts mean much. The patent related to a composition of matter used for a face powder. Various ingredients are listed at pages 526 and 527. The invention was bottomed on the ratio of the ingredients and, as the Court said, "*concerning that ratio the patent disclosed no information.*" Moreover, not only was the ratio not within the skill of the art but, as the Court said "no amount of skill or art in following patentee's specification would produce," except accidentally, the result sought. The patentee appreciated this and tried to supply the omitted information regarding the ratio by oral evidence which, of course, the Court said could not be done.

We have carefully combed the reported decisions citing *Permutit v. Graver*, including those referred to by Petitioners; we find that no Court has ever interpreted *Permutit v. Graver* as requiring a patentee to describe a known property of an element or the material of an element employed in his combination; no Court has interpreted this Court's decision as requiring a patentee to describe a property inherent in an element which he did describe. A true and intelligent discussion and application of the rule applied in *Permutit v. Graver* is found in an opinion of the Sixth Circuit Court of Appeals (*Waukesha v. Willys-Overland*, 77 Fed. (2) 906, 909) *by Judge Simons who wrote the opinion in the instant cases, sitting with the same Court as sat in the instant cases* (Hicks, Simons and Allen, *JJ.*).

The Fact Phase: Counsel are just as much in error in their facts as they are at sea in their interpretation of the law. While it is true that the term "flexible" was not used in the written descriptions, other terms were used which mean the same thing. The rose, however, is the rose notwithstanding the name. We can best point out counsel's errors and support our statements by quoting from the opinions of the Courts of Appeals who ruled specifically upon this point.

The following from the decision of the Court of Appeals in the District of Columbia (17 Fed. (2) 686) we think is typical of the application of the facts in the instant case to the law:

> "The drawings of Gulick, we think, clearly disclose the structure of the count. It is contended, however, that his structure is not such as will 'permit free expansion and contraction of the skirt portion.' But the claim expressly covers this objection in the following language: 'Said skirt being split from top to bottom on one side only of the pin bosses to permit free expan-

sion and contraction of the skirt portion.' We think it clear that the object of the split is to permit of this expansion, and, as held by the Board of Examiners, 'under the action of the heat, the circumferental expansion of the skirt would necessarily flex the webs sufficiently to permit the expansion without substantial increase of the diameter of the skirt.' "

The Court of Customs and Patent Appeals concurred in this view (47 Fed. (2) 366-367):

"The main contention of appellant, and the chief subject-matter in controversy in this long and hotly contested interference, is that Gulick's structure does not contain in it means for joining the cylinder engaging parts a resilent yieldability. On this question the tribunals of the Patent Office concur in holding that Gulick's disclosure does show such resilient yieldability and that he can make the claim.

"This part of the issue in this case was before the Patent Office tribunals in an interference case between Gulick and Long. Long contended that Gulick's construction was rigid and could not operate to permit free expansion and contraction of the skirt portion. The Law Examiner held that 'the flanges or ribs 17 and 18 must allow such expansion and it is not material for the present purpose whether they move about one end or are slightly flexed laterally. * * *.' Upon appeal to the Examiners in Chief they said: 'If the webs 17, 18 were so rigid that they would not yield laterally, the slot would have no function.' Upon appeal to the Commissioner, he said: 'The material of which both types of pistons are made will readily yield to the small extent required to bring the piston skirt to the proper diameter. * * *.' Then upon appeal to the Court of Appeals of the District of Columbia, Mr. Justice Van Orsdel, speaking for the court, said: 'We think it clear that the object of the split is to permit of this expansion' and that Gulick had the right to make the claim 'beyond question.' *Long v. Gulick*, 57 App. D. C. 98, 17 F. (2d) 686, 687. The claim there at issue, while somewhat different from the count at bar, called for

a split skirt 'to permit free expansion and contraction of the skirt portion.'

* * * * *

"We conclude that Gulick has the right to make the claim."

The contention that the rule followed by the appellate Courts in the above quotations had been revoked or left stranded by this Court's decision in *Permutit v. Graver* was urged upon the Sixth Circuit Court of Appeals with the same fervor that it is urged upon this Court here. Therefore, in adhering to the decisions of the other appellate Courts, the Sixth Circuit Court of Appeals must have fully considered such contentions and rejected them. (R. pp. 2385 and 2391.)

Counsel are likewise confused about this Court's opinion in *Powers Kennedy v. Concrete*, 282 U. S. 175. In that case the patented invention of McMichael was antedated by Leake as the Court said at the top of page 184. The question of identity between McMichael's device and that of the antedating Leake's device was the question discussed by the Court. Mr. Justice Roberts, who wrote the opinion of the Court, finally cited as conclusive proof of identity the fact that McMichael had copied Leake's claims, with the justifiable inference that such copying was an admission of identity. It was for that purpose that the learned Justice made the statement quoted at the bottom and the top of pages 12 and 13, respectively, of the Petition. It is plain that no such interpretation was intended to be given to the language as counsel here seek.*

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* It thus becomes clear that the statement at the middle of page 20 of plaintiff's brief regarding the *Powers Kennedy Case* is erroneous. This Court's statement that "This of itself destroys the patent" refers to the admission of identity between the patented invention and the device of the prior art and not to the fact that claims were added. The right of an applicant to amend and add claims is established by authority ancient and current.

Assuming that patent claims may be held invalid when there is a broadening of the claim in the face of adverse intervening rights, such a situation does not exist in the case at bar, first, because there was no broadening of the subject matter claimed since Claim 1 of Gulick was presented in the original application as it now appears in the patent and, second, because intervening rights are not sufficient since such rights must be adverse as well as intervening. The only rights recognized as such in the premises** that intervened in the instant case were those of the plaintiff's licensees and no Court has ever held that a patentee has forfeited any of his privileges under a patent because of the "intervening rights" of those operating under him.

At page 19 of the Petition counsel state their position on the first specification of errors as follows:

> "While, at the time the question was presented to the tribunals of the Patent Office and the administrative courts, it was the practice of the Patent Office to permit amendments describing a supposed 'inherent' mode of operation or characteristic of a structure shown only in the drawings of a patent application, that practice was unqualifiedly overthrown by this Court's decision in *Permutit v. Graver, supra.*"

It would not matter if it had been the rule in the Patent Office, prior to *Permutit v. Graver,* that a description in a patent specification might be amended to describe characteristics of a structure said to be inherent in the drawing of the patent application, which was not hitherto described in the descriptive part of the specification, for no such thing was done in connection with the Gulick application. What was done there was to merely amplify and state in other words matter which was already described in the specification as well as illustrated in the

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** —paper rights have never been so recognized—

drawings. The purpose of this amplification was to make clear to those unskilled in the art what was already clear to those skilled in the art. The following language on this subject appeared in the original Gulick specification (R. pp. 1837-1839):

> "One of the objects of the present invention is to provide a piston which is not adapted to expand against the cylinder wall to such an extent as to seize or stick.
>
> "Another object of the invention is to provide a piston with a skirt slightly separated from the head of the piston and split longitudinally so that it will not expand in circumference with a force great enough to cause the piston to stick in the cylinder.
>
> * * * * * *
>
> "In order that the skirt may not expand an undue amount when the piston is heated, as under operating conditions, it is split longitudinally as at 21.
>
> * * * * * *
>
> "It will be seen that in addition to providing a piston with a split skirt, the above described construction also provides an extremely rigid connection between the piston pin bosses and the skirt of the piston * * *."

There could have been no doubt in the minds of anyone skilled in the art who is familiar with piston constructions that the reference to the rigid connection was a reference to the vertical rigidity of the piston which is a characteristic as important as the lateral flexibility, and that the reference to the expansion to the cylinder wall without sticking or seizing was a description of the property of transverse yieldability only. These conclusions follow from several considerations. First, the use of the term "in addition," appearing in the last above quoted paragraph, distinguishes the previous description of the transverse operation from the description of the feature to follow, i.e., the

vertical feature which is said to be "extremely rigid"; second, the use of the word "also" in the same paragraph likewise divides the discussion of the transverse operation from the vertical and distinguishes the two; third, if the term "rigid" were used to mean the vertical, it would respond to the description and the known features of the piston whereas, if it were applied to the piston transversely, the piston would seize and stick and, therefore, fly in the face of the other portions of the description. Counsel offer no proof that this language was not a disclosure to those skilled in the art of vertical rigidity and transverse flexibility. All of those skilled in the art who have discussed this subject, including the many judicial and administrative tribunals to which the Patent Office refers, found that it was a disclosure to those skilled in the art of transverse flexibility and vertical rigidity. We are, therefore, not here confronted either with any such rule as counsel say was current in the Patent Office prior to *Permutit v. Graver* or to any such rule as counsel say was made by *Permutit v. Graver*, but with the rule that a patentee may, during the prosecution of his application, amplify matter contained in the description so that it will be clearer to those skilled in the art and clear to those unskilled, as well. Such has always been the rule in this and other Courts. See *Michigan v. Sutherland*, 29 Fed. (2) 179, 184 where the rule is stated and authorities following the same, including opinions of this Court, are collected and cited by Judge Knappen speaking for the Sixth Circuit Court of Appeals.

The "Second Specification of Errors" presented by the Petition (p. 16) complains that the finding of commercial success by the Court of Appeals was based on the royalties paid the plaintiff by its licensees under its patents. This is incorrect and would be immaterial if correct. The basis

upon which the Court of Appeals found commercial success in the instant case is stated by that Court at page 2388 of the record. After investigating and eliminating all other possible explanations except the merit of the invention, for the wide adoption and use of the patented pistons, the Court concluded that no other alternative inference could be drawn than that the commercial success was due to such inventions and, further, that such was confirmed by the fact that the patented pistons has been adopted only after exhaustive tests by skilled and disinterested engineers working in an industry, which was meticulous and skeptical about the acceptance of new devices, no matter how enticing they appeared from theoretical considerations.

However, before coming to the consideration of commercial success the Court of Appeals had found invention, based upon long and unsuccessful searches for a solution of the problem by those most skilled in the art and the like. (R. pp. 2387-2388.) Such findings alone are sufficient to support the finding of invention (*Expanded Metal* case, 214 U. S. 366; *Temco v. Apco*, 275 U. S. 319). The finding of commercial success was at most, therefore, merely contributory to the finding of invention. It is apparent that invention would have been found in view of the prior efforts and failures to which we have referred even without the further commercial success indicated by the sums of royalties paid. However, as is apparent from the Court's decision, the payment of the royalties, which is ordinarily considered evidence of commercial success, was viewed by the Court of Appeals as so much less important than the other grounds discussed by the Court that the royalties were not even mentioned.

Counsel thus attack the finding of the Court of Appeals on the presumption that such finding was based on the only pertinent evidence on which it was not based.

We think the findings of the Court of Appeals also answer the contention that the success of aluminum pistons was due to such things as the "strength of the hands into which the patent came" and likewise to the contention that it was due to other inventions or to expired patents.

In view of the clear discussion and finding of the Court of Appeals we will content ourselves with denying the allegation that the success of the pistons was attributed by us or our expert to other inventions or other patents. It would lengthen this brief unduly to prove the inaccuracy of all of the erroneous statements in the petition. We think it also clear from the discussion of the Court of Appeals that the licenses were taken because of the merits of the inventions and not because of cross licenses.

The finding of the Court of Appeals that the commercial success was attributable to the patents in suit and not to other patents owned by the plaintiff is based upon the record and the evidence of the witnesses including that of the defendant's own expert who testified that the very identical pistons shown in the Maynard patent were made, sold and used in large quantities. (R. pp. 462, 471 and 955.)

The "Third Specification of Errors" relates to the views of the Court of Appeals upon the presumption of validity of a patent which are as follows (R. p. 2388):

> "So also with respect to the presumption that attaches to the validity of a grant by the Patent Office. Where, as in this case, substantially all pertinent prior art has been cited against the patent, where in hard fought interferences novelty and invention have been challenged, and where priority of conception has been finally adjudicated only upon repeated review in both administrative and judicial forums, the patent should not be stricken down except upon very clear and convincing proof of invalidity."

It is stated that these views are wrong where the rule relied upon by the Patent Office and the earlier cases has been reversed by a later decision of this Court. The above finding by the Court of Appeals is in harmony with this Court's decision in *Radio v. Radio* which is later than the decisions of the administrative and judicial tribunals by which the Court of Appeals found the presumption to be strengthened. We know of no later decision of the Court of Appeals which overcomes the rules relating to presumption of validity expressed by the Court of Appeals and by this Court in *Radio v. Radio.* If counsel mean to repeat their erroneous contentions regarding the finding of this Court in *Permutit v. Graver,* our answer is to be found in our discussion of this decision. We may add, however, that in view of the presumption of validity which arises from all of these decisions, including that of this Court in *Radio v. Radio,* if and when any doubts arise as to the proper interpretation of this Court's decision in *Permutit v. Graver,* they should be resolved in favor of the validity of the patent for the reasons we have stated.

The "Fourth Specification of Error" is merely formal and needs no discussion by us except to say that the Court of Appeals made no error.

The Standing of the Master's Report: Under this heading counsel rely upon the often quoted expression from the opinion of Mr. Justice Holmes in *Adamson v. Gilliland,* i.e., that (under certain circumstances) the Master's report should be "treated as unassailable." Doubtless this expression has led to some confusion in some of the lower courts. Perhaps it should not have done so; but there is no occasion for this discussion here because we take it to be generally understood that for the very purpose of put-

ting an end to such confusion this Court adopted General Equity Rule 61½. Since the adoption of that rule there is obviously no force in contending that the Master's report has any effect excepting that which is carefully stated in that rule. The Circuit Court of Appeals for the Sixth Circuit has always adhered to that view of the Master's report which this Court, by the adoption of Rule 61½, made obligatory upon all the lower courts.

In the instant case, the only theory upon which petitioners appeal to *Adamson v. Gilliland* is that the Master failed to find commercial success. "This evidence failed to convince the Master that any of the patents in suit were commercially successful * * * sufficient to justify his refusal to accredit the patents in suit with commercial success." (Pet. p. 21.) In this respect there is not a scintilla of evidence to support the Master's conclusion. All of the witnesses testifying on the subject, including the defendant's own expert, testified not only that the patented pistons were successful, but that the identical form illustrated in the Maynard patent had gone into wide use. (R. pp. 462, 471, 955.)

Overlapping Patents: Much is said in the brief about overlapping patents and a diagram is arranged on page 5 to support this contention. People often lose sight of the fact that it is the very purpose of the Constitution and the patent laws to encourage the making of inventions and become alarmed when they find that the result aimed at by the Constitution and the patent laws has been achieved. In this achievement it is inevitable that devices originally invented will be improved upon and that the improvements will often be made before the patents upon the original inventions have expired. Thus overlapping patents have become one of the inevitable concomitants of the Constitution

and the patent laws; in fact, such a result was in contemplation and one of the purposes of such rules and laws. This Court has had occasion to recognize and commend such a result (*Eibel Process* case, 261 U. S. 45, 63). Counsel's discussion on this subject, as might be truly said of all their discussions, is a challenge to the wisdom and propriety of the provisions in the Constitution about rewards for inventions and the patent laws. Their complaint, in fact, is that inventions should not be made and patents should not be taken out on them. If such were the rules Petitioner and Sterling would have no pistons to make, for up to date the only pistons they have made have been duplications of those made by the complainant's licensees.

Conclusion: It follows that the only alleged error of the Court of Appeals, which is other than cumulative or a determination of which could be more than a declaratory ruling, is the claim of the insufficient disclosure in the Gulick original application and the propriety of the clarification thereof. Three Appellate Courts and numerous other tribunals have held contrary to Petitioners' contention on that point.

In an attempt to find some mote of dissent from these numerous concording views, counsel grasp at and rely upon the Master's statement that there was "an attempt" to do what all these other tribunals found had not been done. Since this finding of "an attempt" cannot be construed to be a finding of a doing, there is difficulty in finding even a mote of dissent.

Hence, the Petition is no more than a request for a review of the concurring decisions of all the Appellate Courts ruling thereon, and beyond that a request for a review of rulings of the Court of Appeals which counsel claim are erroneous and which would be merely declaratory if brought here and reviewed.

Neither rule of, nor precedent in, this Court is authority for certiorari on such a showing.

We think the Petition should be denied.

Respectfully submitted,

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In the Supreme Court of the United States

OCTOBER TERM, 1938.

No. 3.

THE SCHRIBER-SCHROTH COMPANY,
Petitioner,

vs.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.

No. 4.

THE ABERDEEN MOTOR SUPPLY COMPANY,
Petitioner,

vs.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.

No. 5.

THE F. E. ROWE SALES COMPANY,
Petitioner,

vs.

THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.

RESPONDENTS' BRIEF.

PETITIONERS' STATEMENT OF THE CASE.

This Statement (Pet. Bf. pp. 2-14), we insist, is inaccurate and misleading in many particulars. In the interest of brevity, we pass by any introductory summary of these errors, and point out the important ones hereafter in connection with its specific subject matter.

FOREWORD TO THIS BRIEF.*

We agree with the statement on page 17 of petitioner's brief that "This Court will not consider any question other than those upon which the petition for certiorari was based." The petition for certiorari (pp. 8-11) shows three, and only three, "reasons relied upon for the allowance of the writ." They are: (1) that an essential element of the patented combination was not described in the application as filed, but was later inserted without sufficient justification and in disregard of *Permutit v. Graver* and *Powers-Kennedy v. Concrete*; (2) that an unidentified fact decision of the Master was overruled, inconsistently with *Adamson v. Gilliland*; and (3) that the decisions of the patent office tribunals should not have been followed (pursuant to *Radio Corporation v. Radio Laboratories*) because the legal basis of those decisions was inconsistent with the later opinion of this Court in *Permutit v. Graver*.

The specification of errors (pp. 15-16) repeats, in other words, the same three complaints, adding only a general allegation of error, too vague to be effective.

We do not understand that, in such a situation, extended recitals in the statement of facts, which might argumentatively suggest additional complaints, can avail to broaden the specific "reasons" in which the petition culminates.

Petitioners' brief wanders far from these three points and discusses many other matters. Among these matters which should be thus excluded from present consideration are:

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*Throughout this brief, the emphasis found in any quotation is added by us.

(1) *That the Gulick and Maynard patents are invalid because not involving invention over the prior art.* We cannot suppose that the Court intended to bring up for decision any such broad question of invention. The court below found invention, and elaborately and forcefully stated its reasons for its conclusion. The petition does not challenge this reasoning or this conclusion,—except as challenge may be found in the three "reasons." (But see Sec. II, *infra.*)

(2) *That Gulick and Maynard were anticipated* by Long or by Franquist or by Schmiedeknecht or by Spillman & Mooers, etc. In each of the Gulick-Long interferences found to involve patentable subject matter, priority was awarded to Gulick.* Defendant did not think proper to call Long as a witness in this case. Schmiedeknecht, although he had a slightly earlier filing date than Gulick, was not carried back of Gulick's invention date, and is not prior art. The patented claims in suit each distinguish from Franquist and Mooers & Spillman. Each is foreign to Gulick's basic thought, in structure, mode of operation, and results, and both were before the Patent Office and repeatedly considered by the Examiner (R. pp. 1843, 1857, 1938, 1946) and in many *inter partes* interference proceedings. (R. pp. 1549, 1555, 1577, 1657, 1660, 1665, 1666, 1936 and 1937.) Both experts agreed that each prior art device required modification to obtain the structure, mode of operation, and results of the patents in suit. (R. pp. 567, 528, 529, 952, 986.) All of this is

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* R. pp. 1533, 1538, 1544, 1553, 1564, 1569, 1571 (17 Fed. (2) 686); 47 Fed. (2) 365 and 47 Fed. (2) 366, involving Gulick patent claims 1, 2, 11, 12, 13, 15, 28, 29, 30, 31 and 32. Long copied claims 1, 2, 11, 12, 13, 15, 30, 31 and 32 from the Gulick application wherein these claims originated.

immaterial, if we are right in our belief that these issues were not presented in the petition. (But see Sec. II, *infra.*)

(3) *That Gulick had abandoned his invention, or had put it in public use at a fatally early date.* The brief contains many references to this contention; but, clearly, these questions are not now involved. (But see Sec. II, *infra.*)

(4) *That the legal title to Gulick and Maynard patents had been united with others in an estate under an express trust, here referred to as a patent pool.* This subject has only remote and inconsequential bearing on any of the "reasons relied upon," but will be discussed only generally under Sec. I hereof. Petitioners' brief comes to the "patent pool" again and again as if it affected plaintiff's right to sue or right to recover, and as if the question of unlawful monopoly were somehow involved and the ownership of these patents by an estate was reprehensible. (See Sec. II, *infra,* for our discussion.)

These and other points urged or recounted in petitioners' brief we believe are not within the proper scope of this hearing; but we do not wish to avoid discussion of them, if the Court should think them to be involved. We therefore propose, in Section I of this brief, to discuss the three reasons which were relied upon for the allowance of the writ, and in the following Section II the claims or theories which petitioners now present by their brief.

SECTION I.—THE QUESTIONS PRESENTED BY THE PETITION.

PETITIONERS' "REASON" NUMBER ONE.

Petitioners' first reason relied upon,—disregard of *Permutit v. Graver,*—eventually leads to and depends upon the disclosure of the yielding or flexible character of the structure, as that character may affect the validity of the Gulick and Maynard patents. This character may be named (not very accurately) web flexibility.

WEB FLEXIBILITY—IN THE ABSTRACT.

In approaching this subject,—which constitutes we believe the gist of the controversy which this Court intended to review,—the first essential is that we appreciate the inherent properties of a flat metal sheet, relatively thin as compared to its length and breadth, referred to in both original applications as a "web."* Everyone has always known that as against a force exerted in the plane of its length or breadth, it is strongly resistant and tends to be strong and rigid, while, as against a force at right angles to its plane, it tends to bend. In other words, it is rigid in one direction and flexible in the other. No amount of descriptive words can make these properties more certain and sure; no absence of words expressly stating these properties can make their presence less certain and obvious.

In the Gulick and Maynard constructions, as described and shown, (and speaking of the piston as when the cylinder is vertical, with the combustion chamber at the top) two webs or flat strips of metal, integral with the head,

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* Defined in *Webster's New International Dictionary,* Second Edition, as "A thin metal sheet, plate, or strip, * * * as the blade of a sword (Obs.), a saw, etc., the thin sharp part of a colter, * * *"

depend therefrom and carry respectively the pin bosses. These webs have also, carried as far down as the top of the pin bosses, central right-angled flanges obviously intended and operating to strengthen and stiffen this part of the web. The pin bosses, in turn, carry the skirt through laterally extending webs, which functionally seem to be no part of the boss supporting webs, although structurally they are continuous therewith. They have no horizontal stiffening flanges. The depending, boss supporting webs are completely strong and rigid vertically, and as they must be to resist say 1200 explosive blows per minute, and 4800 reversals in direction each minute (running at only 2400 R. P. M.). In the same way, the skirt carrying webs are vertically rigid, and this rigid vertical relationship of head and pin bosses and skirt must always be perfectly preserved, else the device could not stand up a day. The skirt is separated from the head, and one of the thrust bearing faces of the skirt is split longitudinally between the boss connections to permit the skirt to yield to pressure from the cylinder wall.

In operation, as the increasing effects of the heat, affecting cylinder walls or skirt or both, increase the pressure of the skirt upon the walls, the slot in the skirt tends to close, while the skirt still maintains substantially cylindrical shape. It follows inevitably that parts of the skirt supporting webs yield or flex at right angles to the plane of those webs—at least enough to permit the slot to close somewhat and thus compensate for the skirt expansion. This demonstrates horizontal lateral flexibility in the webs at that point,—though probably not enough to be seen with the naked eye. Without this degree of lateral flexibility (slight though it is) in the skirt supporting web, the structure could not operate, as

its operation is obvious from inspection and is described in the (original) specifications of Gulick and Maynard and as the experts on both sides say it will operate.

This is the physical structure as to which petitioner's contention arises. The physical structure and mode of operation of both the Gulick and Maynard pistons are fully described. The complaint is that the webs 17 and 18 of Gulick were not, in the original application, said to be flexible in a lateral direction and that neither the Maynard application or the issued patent specifically said that those webs were flexible. Each application did describe the yielding properties of the skirt and the reason for the longitudinal split in the skirt and its relation to the remaining structural elements of the piston. Judge Simons elaborated on this subject. (See R. pp. 2384-2386.)

WEB FLEXIBILITY AS AN ELEMENT.

From the petition and petitioners' brief the reader would suppose that, by belated amendment, this flexibility was added as an element to the structure of the Gulick piston or must be read into the structure of the Maynard piston. In each the structure, mode of operation, and results were described in the original application.

We say that the whole theory of petitioners (which seems to be their outstanding theory) to the effect that a new element was inserted by amendment or is now to be read into these piston patents, utterly fails in fact. No new element was inserted; no new element is to be read in. The structure, mode of operation and results remain the same as before.

THE COURT OF APPEALS DID NOT SAY THAT A WEB THAT WAS FLEXIBLE WAS AN ESSENTIAL ELEMENT OF THE PATENTED PISTONS.

Hence not only the petition for certiorari in this cause, but the petitioners' case here is based upon a false premise.

What the Court of Appeals said was that "flexible webs" (92 Fed. (2) 337) and "webs laterally flexible" (92 Fed. (2) 334) were elements employed in the pistons illustrated in the patents in suit, which, of course, illustrate no more than the preferred forms of the inventions covered thereby and do not limit the patents to the structural details illustrated (R. p. 1286), as is the well established rule of law (*U. S. v. Societe*, 224 U. S. 309, 328; *Winans v. Denmead*, 15 How. 341; *Machine Company v. Murphy*, 97 U. S. 120).

In further describing the particular embodiments illustrated in the patents in suit the Court of Appeals said (R. p. 2385):

> "Gulick separated the smaller ring carrying head of the piston from the somewhat larger skirt by a groove or air gap. This tends to prevent the passage of heat from the head directly to the skirt and permits the bearing faces of the skirt to yield to pressure independently of the head. The wrist pin bosses are pulled inwardly from the skirt periphery, and instead of being supported by the skirt are carried from the piston head by depending flanges, thus providing a vertically rigid support for the bosses with freedom of lateral motion in a direction at right angles to the load thrusts on the piston."

This is merely a description of how Mr. Gulick arranges and operates the embodiments of his invention illustrated in his patent. The Court does not say that the "lateral motion" must be realized by web flexing; there

is nothing in this statement, or any other part of the opinion, limiting the lateral motion to one secured by flexing of the web. Certainly there is nothing in this or any other statement which can be taken as justification for revoking or ignoring the rules in the cases in this Court cited.

It has never been the law that a court's discussion of the properties of the elements in a patent claim make those properties essential. We do not believe that any court in writing an opinion ever intended or expected that its language would either be so construed or so urged.

Therefore, counsel are asking that the patents be invalidated because the Court of Appeals held that the flexible web was a sine qua non when the Court of Appeals did no such thing. Even if that Court had done so, it would have been error in view of the rule stated by this Court in *Winans v. Denmead* and the other cases cited *supra*.

Therefore, petitioners' cause is based on a premise which is false in fact and unsound in law, if true.

FLEXIBILITY, ORIGINAL AND INHERENT, AS ADJUDICATED BY THE TECHNICAL TRIBUNALS.

Rarely (never within the knowledge of respondent's counsel) has the very point in issue been so completely and so often decided, and without dissent. Gulick was involved in fourteen interferences (not all of which appear in the Record). Over and over again his various opponents seized upon the point which petitioners now make, viz., that Gulick's original application did not expressly specify any lateral web flexibility, and therefore he was not entitled later further to describe the web elements of his structural combination as having this inherent property.

If an amendment is made in a specification that is not fairly within the scope of the original application, this is called, in patent office nomenclature, "new matter." And as to that, the applicant is not entitled to his original filing date. The rule is fundamental that it is *not* new matter for the applicant to add, in express words, anything which was fairly and reasonably disclosed in the original specification.

By patent office practice, when an interferant thinks his opponent's specification does not justify the claim in controversy, he makes a motion to dissolve the interference because his opponent is not entitled to "make the claim." The primary examiner, in declaring the interference, has considered and declared that each party was entitled to make the claim. Such a motion to dissolve is referred to the law examiner. If he overrules it, the interference proceeds on this basis to the examiner of interferences, who may refuse to follow the law examiner. The question thereafter persists in successive appeals to the appellate tribunals.

Gulick's opponents, one after another, adopted this practice. It goes without saying that the patent office officials and tribunals, by constant familiarity with these principles and their application, are presumptively far better fitted to decide what is "new matter" and whether an applicant can "make the claim," than is some lawyer, however generally intelligent, who has had no experience along this line but happens to be appointed Master in a patent case.

In one of the Long-Gulick interferences the law examiner considered an interference count which afterwards became Claim 13 of the Gulick patent. The law examiner said (R. 1542):

"If the split permits free expansion and contraction of the skirt portion there is no need for argument to support Gulick's right to make the count. * * * An expansion and contraction of the skirt portion is therefore permitted by the longitudinal slit. * * * If the skirt expands circumferentially when heated, as the specification states, the flanges or ribs 17 and 18 must allow such expansion, and it is not material for the present purpose whether they move about one end or are slightly flexed laterally. The stated purpose of the longitudinal split being to prevent too great circumferential expansion, obviously some circumferential expansion takes place. * * * Gulick discloses all the structural elements set forth in the count, and refers to the circumferential expansion of the skirt, the split 21 preventing too great an expansion. This seems to be all that is necessary, and it is not important how Gulick may have described his device if as a matter of fact it has the requisite structure and function."

This decision was on April 4, 1924, and the same day the same law examiner decided the same question upon a similar motion of Hartog in another interference. The count (R. 1549) afterwards became Claim 29 of the patent suit (not one of the claims now involved). It called in words for "internal yielding ribs, etc." The law examiner said (R. 1549-50):

"It will be apparent that the question for decision is whether or not the ribs 17, 18, 20 are yielding. * * * There are several forces at work etc. * * * it is not seen how * * * some lateral flexure or yielding of the rib [web] 18 between the boss and the skirt can be avoided. The yielding need not be great or due to any special structure of the rib to support the count. Nor is it necessary that the entire rib should yield. If it yields at all for any purpose or for any reason, it would come within the scope of the count. It can not be conceded that the purpose of slot 21 in Gulick's skirt is defeated by alleged rigidity of the lower parts of the ribs."

One of the interferences with Hartog and Long was heard before the examiner of interferences July 2, 1928. He says (R. 1551-2) that there is no sufficient reason to disturb the holding of the law examiner, and he notes that the Court of Appeals of the District of Columbia has then already ruled that the Gulick webs are necessarily flexed under the action of heat. In another interference on the same day he made the same ruling. (R. 1534.)

The Long-Gulick interference was appealed to the Board of Examiners-in-Chief, whose decision was made August 7, 1924. (R. 1544). The Board said:

> "The right of Gulick to make the claim is now raised as the sole ground of this appeal. * * * It is admitted that the drawings of Gulick disclose all the structure specified in the count, the only contention being that his structure is such that it will not 'permit free expansion and contraction of the skirt portion.' The skirt is split at 21 and the specification states, page 3, line 21: 'In order that the skirt may not expand an undue amount when the piston is heated, as under operating conditions, it is split longitudinally as at 21.' The object of the split is to permit this expansion * * *. If the webs 17 and 18 were so rigid that they would not yield laterally, the slot would have no function. Under the action of the heat, the circumferential expansion of the skirt would necessarily flex the webs 17 and 18 sufficiently to permit the expansion without substantial increase of the diameter of the skirt.
>
> "We have no doubt that Gulick can make the claim."

One of the interferences reached the Commissioner of Patents (acting by the first assistant). The same point was involved. In a careful opinion (R. 1663-1666) he discussed the questions involved concluding (p. 1665):

> "It is believed plain that the latter (Gulick) is entitled to make the count of the issue."

One of these interferences, and involving the same question, came before the Patent Office Board of Appeals,* which said, (R. 1539):

"It is urged by both Long and Hartog that Gulick is not entitled to make the count. It is contended that there was nothing in the original disclosure of the Gulick application which in any way referred to the means for supporting the skirt of the piston as being resilient. * * * We reach the conclusion that although there is nothing in Gulick's application as originally filed that refers to resiliency, we consider that this feature is necessarily inherent in the structure, as the support for the split skirt must be resilient in order to allow the piston to expand without expanding the skirt. **We therefore concur in the decision of the law examiner.**"

On a petition for rehearing the Board said (R. 1556-7):

"* * * Hartog urges that we were in error in holding that the party **Gulick had a right to make the count because the support for the piston skirt must necessarily be resilient.** We have given careful consideration to the memorandum offered in support of the petition but it is unnecessary to discuss this in detail. All the matters referred to therein were before us at the time our decision was rendered and were carefully considered. The point upon which the reconsideration is asked is probably the most important one in the entire series of interferences in which the petitioner is involved. The point has been repeatedly considered in one form or another by tribunals of this office and also in one instance by the Court. We reviewed the entire record and carefully considered the arguments presented. **As a result of this investigation our judgment was deliberately made** and we find no reasons presented in this petition which influence us to reach any other conclusion."

* Of which the Assistant Commissioner of Patents was a member.

In still another appeal the Board said (R. 1560):

"* * * It is perfectly clear, however, that when the piston skirt was split it was for the purpose of allowing it to yield when the heat caused the piston to expand. If the piston expands and the skirt does not we consider that the support for the skirt must necessarily be resilient and that this is an inherent quality of all pistons of this general nature. We therefore concur in the opinion of the law examiner as referred to in the opinion of the Examiner of Interferences that Gulick has a right to make the count."

This conclusion was not only unanimously reached by all the patent office officials and boards but also by the District of Columbia courts having appellate jurisdiction. In *Long v. Gulick*, 17 F. (2d) 686, (R. 1546) the Court of Appeals recites Long's contention that Gulick had no right to make the claim and the denial of the motion by the law examiner, by the board of examiners-in-chief and by the Commissioner of Patents, and says:

"The drawings of Gulick we think clearly disclose the structure of the count. (Claim 13 of the Gulick patent.) It is contended, however, that his structure is not such as will 'permit free expansion and contraction of the skirt portion.' But the claim expressly covers this objection in the following language: 'Said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.' We think it clear that the object of the split is to permit of this expansion and, as held by the Board of Examiners, 'under the action of the heat the circumferential expansion of the skirt would necessarily flex the webs sufficiently to permit the expansion without substantial increase of the diameter of the skirt.' In this view of the case, the right of Gulick to make the claim is beyond question."

Another interference involving the same question reached the Court of Customs and Patent Appeals, and is reported in 47 F. (2d) 365, 366. The Court said:

> "The only issue presented in this case, as now stands, is whether or not Gulick had the right to make the claim. [Count 2 of the interference, Claim 31 of the patent, not in suit.] * * * (Reciting a long succession of patent office rulings) * * * (p. 367). It seems clear to us that, if the slot in the skirt of the Gulick piston takes care of expansion, it is by reason of the fact that the cylinder engaging portions of the skirt flex or yield, which yielding or flexing must necessarily result, at least in part, from the resiliency of the joining means. **We conclude that Gulick had the right to make the claim.**"

The same court in another appeal (47 F. (2d) 367, 8, R. 1562-3) reexamined the same question, and adhered to its decision.

When, to these decisions of the patent office and District of Columbia tribunals, we add the discussion and conclusion of the court below, we have some eight or ten patent office officials and eleven judges of federal courts all agreeing that Gulick's original application sufficiently disclosed the existence of web flexibility. On the other side there is only the Master; and the controlling point, that the specification-described skirt action necessarily involved this flexibility, was never even observed by the Master, so far as his report shows.*

PERMUTIT v. GRAVER.

Petitioners attempt to escape from the official and judicial consensus as to the originally sufficient disclosure of

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*He said (R. 1152) that Gulick could not rely on the inherent flexibility because it was not novel,—not at all because it had not been sufficiently implied to be a good disclosure.

flexibility, only by saying that these tribunals, in order to reach their conclusion, went beyond the specification and depended essentially upon drawings of something not described,—inconsistently with the later decision in *Permutit v. Graver*. This is a misapprehension; there was no such dependence on drawings, but indeed if there had been, it would have been proper, under the circumstances and for the use made of it in this case and, at the time of such use.

Petitioners' whole case, under this first reason (and indeed upon the second and third) depends upon the supposed rule of *Permutit v. Graver*. There is no such even superficial analogy as requires extended discussion. This for several reasons:

1. In *Permutit v. Graver* the court was considering only the patent, as issued, and held that a vital structural element, the "free" bed, not shown in the drawings or described in the specification (indeed probably in conflict therewith), could not be read into the issued patent to save it from anticipation. There is no such question here. No one doubts that the specification of the Gulick patent, as issued, sufficiently describes web flexibility. Petitioners' complaint is that the specification had been improperly amended. In *Permutit v. Graver* there had been no amendment.

2. In *Permutit v. Graver*, the element which the court below had erroneously read into the patent was a structural element (although in negative form). As the patent had been reconstructed by the court below, it called for the absence from the structure of a locking cover. In the present case neither the presence nor absence of any structural element is involved. The complaint is that (before amendment) the specification did

not describe an inherent functional property of the material of which a completely disclosed structure was made. In *Permutit v. Graver* there was no such question.

3. In *Permutit v. Graver,* the erroneously supplied element had been the one by which alone the invention was distinguished from the prior art, and by which alone anticipation was avoided. The prior art showed the exact combination of the patent claim, unless for this one feature. In the present case the prior art did not show any anticipation, that was complete excepting for this one feature. There was no prior structure having the complete combination of physical parts claimed in Gulick and Maynard except for having webs which were rigid in all directions against all stresses. The Gulick and Maynard patents were for these physical combinations of structural elements, with whatever inherent properties the individual elements of the combination might have.

4. The question now here is not about construction of a patent, as issued and as affected by R. S. 4888; it is only about the sufficiency of a disclosure in an original specification and drawing in order to justify an amendment in the Patent Office, before issue, inserting a few additional words of description concerning the structure already completely shown and described. It has always been the fundamental rule of procedure in the Patent Office that the specification and drawing together constitute the disclosure, and deficiencies in either might be supplied from the other, if the disclosure in the other was clear enough. So far as we know, this rule has never been questioned in the Patent Office or by any court. The Patent Office, in permitting or denying such an amend-

ment, is concerned only with the question "is it, considering both specification and drawings, new matter, or is it consistent with and to be reasonably implied from the original disclosure though completely shown only in the specification and not in the drawing or only in the drawing and not in the specification?" The Patent Office doubtless should look favorably upon an amendment to a specification or drawing which is only of explanatory character.

5. If it were to be assumed that *Permutit v. Graver* was intended to hold (for which assumption there is no basis) that the Patent Office, in approving a specification amendment as not being new matter, could not depend upon the drawing alone, unaided by the specification description, as negativing the "new matter" objection, it would not be important, because there was here no such sole dependence. All the Patent Office tribunals and the reviewing courts placed their dependence upon that part of the specification which distinctly explained the expansion of the skirt and the limitation of that expansion so that the vertical slot would somewhat close. Neither any Patent Office tribunal nor any court referred to the drawing, except in a casual way to say that it was sufficient to show the structure which the specification was describing. No one has ever disputed this; both experts agree that the original disclosure by specification and drawing was sufficient so that anyone skilled in the art could not fail to produce therefrom the piston of the patents, and that if it was made of any material proper for that purpose and as any skilled mechanic would inevitably make it, the webs would have enough horizontal flexibility or yieldability so that the slot would close as intended and the piston would work. Petitioners' whole

theory that the patents were sustained because the drawings, and only the drawings, showed web flexibility, is an illusion,—not to say a delusion.

There is no need to consider *Permutit v. Graver* more fully; but in Section II we further discuss the true basis and extent of the rule.

THE AMENDMENT OF SEPTEMBER 12, 1922.

Neither at this, nor at any other, time was any one of the claims which were sustained by the court below amended by inserting any reference to web flexibility. So far as now material, the only changes made in the specification were (1) to change the word "extremely" to the word "longitudinally," so that the phrase "the above described construction also provides an extremely rigid connection between the piston pin bosses and the skirt" was thus modified, to read "the above described construction also provides a longitudinally rigid construction between the pin bosses and the guide portion of the piston," and (2) to add that "at the same time, when the longitudinal slit is used, as shown, the web structure has sufficient lateral flexibility to permit the split to close more or less under the action of the expansion forces incident to the heating of the piston." The original language, which was also maintained, was "in order that the skirt may not expand an undue amount when the piston is heated, as under operating conditions, it is split longitudinally as at 21."

Thus we see that the original specification sufficiently disclosed all the mechanical elements of the combination structure, and explained that the office of the slit was to prevent undue expansion of the skirt when the piston was heated under operating conditions. Obviously, this refers

to such an expansion of the diameter of the skirt as would conflict with the interior diameter of the cylinder. Equally obviously, this undue expansion of the skirt diameter would not occur because the slot would close, and so, though the skirt walls could expand circumferentially the skirt diameter would not increase. No elaboration can make it more obvious than it now is and then was, on mere inspection, that there must be at some point in the skirt connections some trifling lateral yielding. This amendment stated in express words what was already necessarily implied. So all the imposing array of tribunals and the court below have held. The Master did not undertake to deny that this degree of lateral flexibility was inherent in the original description; he simply ignored that view.

There is no inconsistency between the original statement that the specified construction provided an extremely rigid connection between the pin bosses and the skirt and the amended statement that this extreme strength and rigidity pertains to the longitudinally exerted forces and that there is, nevertheless, such a slight degree of horizontal yielding as permits the slot to operate as intended. Granting this full lateral flexibility (and slight indeed it is) the structure nevertheless does, as originally stated, provide an extremely rigid supporting construction for the skirt. The strength and rigidity which were required were longitudinal. The charge of inconsistency between the earlier and the later statements is in the highest degree technical; there is no substance in it.

THE POWERS-KENNEDY CASE.

Several references are made to this case. It has no bearing on any question here. The only pertinent holding thereof is that if the specification is amended so as to disclose an invention not disclosed by the original specification, this is new matter and the patent is invalid. No one questions that rule. In *Powers v. Kennedy* the opinion demonstrates that the original specification did not disclose that the concrete was to be pushed forward in slugs rather than continuously, but indicated only the continuous operation. The invention supposed to reside in the successive slug action was first disclosed in the amendment; with that premise the result was inevitable.

Incorrect inferences have sometimes been drawn from the casual reference in the opinion to the fact that the patentee had copied the claims of another applicant. The comment that "this of itself destroys the patent" refers, as the context shows, not to the copying of the claims (which is familiar and indeed necessary Patent Office practice*) but to the fact that the patentee had "lifted" the finally claimed invention out of the application of the other man.

Petitioner's brief, apparently in this connection, refers to the fact that Gulick copied from Hartog one of the claims involved in the interferences.** Very true.

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* Just as Long copied Gulick claims, and went into interference (decided for Gulick).

** Counsel strain to bring the instant cause within the facts of *Powers-Kennedy v. Concrete*, finding it necessary to resort to the Hartog-Pomeroy interference to draw an analogy with the Leake-McMasters interference of the cited cause. Gulick was not in the Hartog-Pomeroy interference. Neither respondent nor the Aluminum Company conducted the interference on behalf of Pomeroy. The Pomeroy patent (R. pp. 1804 and 185) was bought from the inventor long after conclu-

Learning of the phraseology in which Hartog was expressing the common invention, Gulick added a claim in the same phraseology. There was an interference and the Patent office and the courts decided that, based on his original specification, Gulick was entitled to make this claim. So it was awarded to him and it became Claim 29 of the Gulick patent; but it was not passed upon by the court below and it is not involved under any of the issues presented by the petition.

THERE WERE NO INTERVENING OR ADVERSE RIGHTS.

Petitioners argue that there was an *attempt* to broaden the original Gulick application after intervening rights arose, by limiting the web element of the structural combination to a flexible web element, and that, because of this attempt the patent is invalid. (Brief p. 11, enlarging petition p. 9 as to adverse rights.) It is necessary to argue an "attempt to broaden" because the scope of the original claims (1 to 10, inclusive, of the issued patent,

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tion of the Hartog-Pomeroy interference. The Hartog patent (R. p. 1798) was bought after conclusion of the Gulick-Hartog-Long interferences. These facts conclusively distinguish the causes without examining the other facts or the failure of counsel to establish the facts upon which reliance is had. If counsel are correct, this Court held the patent in the cited case invalid because an apparatus patent specification was amended to correct the description of the principle of operation; if counsel are correct the cited case is not applicable here since the amendment of the Gulick application did not change or apply to the principle of operation, but to an amplification of a description of the properties inherent in an element. Moreover, counsel's contention would place this Court's decision in hopeless confusion with the law announced by this Court in *Eames v. Andrews*, 122 U. S. 40, 56, to the effect that an inventor does not have to know or disclose—indeed, he may even misunderstand and misdescribe—the principle upon which his machine operates so long as he describes his apparatus and how to use it, a sound rule of patent law that has been followed ever since by all patent Courts. If the rule were otherwise, all radio and other electric patents, for example, would be invalid because nobody knows what electricity is or the principles upon which it works. They know it by what it does.

claims 2 to 9 being subsequently amended to restrict their scope) comprehended structural combinations embodying the web elements of each device of the contestants in the interference proceedings, including Long. The Court of Appeals, for instance, has held claim 1 of the Gulick patent valid and infringed by the Exhibit 1 structure in this suit. (R. p. 2395.) Since this claim 1 of the patent was in the application as filed (then claim 3 R. p. 1840) and remained in the application with no change whatever, and now appears in the issued patent, there were no intervening rights. This claim 1 of the Gulick patent is verbatim as it was when filed on November 20, 1917, and was allowed in the first Patent Office action. (R. p. 1840 and 1844.) It was copied from the Gulick application by Long and others and was subjected to repeated and bitter attack as to validity in the interference controversies on the same prior art patents that are now asserted by petitioner. (R. pp. 1571, 1936 and 1937.) On these facts petitioners' arguments on intervening rights must fall.

We have now briefly summarized our views as to petitioners' first "reason." Elaboration will be found in Section Two *infra*.

PETITIONERS' "REASON" NUMBER TWO.

A supposed violation of the rule of *Adamson v. Gilliland*, is petitioners' second "reason relied upon." Petitioners have in mind some conflict between fact findings made by the Master and the conclusions reached in Judge Simons' opinion. We are quite unable, from the petition, to identify the conflict to which the petitioners intend to refer.

Petitioners say that the Court of Appeals held that its conclusion, that the aluminum piston problem was not solved until by Gulick and Maynard, was based only upon evidence as to the payment of royalties under the patent pool. The Court of Appeals took no such basis for its conclusion. Its holding was based on the fact that the automobile industry never had adopted to any substantial effect any of the previous inventions, but they had all been commercial failures, while the industry then did adopt to an overwhelming extent forms which embodied the Gulick and Maynard inventions. Instead of holding that this general adoption was because of royalty payments, the court held and made very clear that owing to the elimination of sticking, slapping, etc., without destroying ruggedness and durability, this adoption must have been because the novelty and merit of these inventions were appealing. The mere payment of royalties is among the weakest proofs of industrial approval, as has frequently been held. The Court of Appeals cannot fairly be charged with resting its conclusion on any such slender reed. (See R. pp. 2386-2388.)

Next, the petition seems to say that the Master held that the success of the aluminum piston was ascribable to other things than these inventions, and that the Court of Appeals overruled the Master,—who had seen and heard the witnesses. The fact is, as we view the record, that there was no substantial basis in the evidence for any such conclusion by the Master and we are unable to identify any such finding in his report. So far as we can understand, it all comes to a question of invention over the prior art, which (if not one of law) is at best a mixed question of law and fact. The Master thought there was no invention over Franquist, or over Spillman &

Mooers, or over others of the prior art. Therefore, he thought that the success of the aluminum piston was due largely to these old features rather than to Gulick and Maynard, who had arranged and assembled and modified them into the new and patentable form which the industry adopted and defendant copied. The Master further thought, without any support in the record, that a later trifling modification in the Gulick-Maynard form, which he calls the "Keystone relief," and which had been made by the plaintiff's licensees and which the infringing defendant had copied, played a part in the commercial success. This was such a trifling change, and so clearly did not get away from the Gulick and Maynard patents, that it is difficult to take the claim seriously. The Master had no basis in the evidence for his conclusion,—as one of fact. His conclusion that the Gulick and Maynard patents had not gone into large use, was only another form of his conclusion of law that the patents were invalid, or were confined to their exact form.

Perhaps what can be most plausibly claimed to be conflict between the Master and the Court of Appeals has reference to the adoption and use of the patented pistons by the industry. In aid of the presumption of patentability, plaintiff contended that the industry had accepted and used the Gulick and Maynard pistons, or pistons embodying these inventions, by the million. Such a contention is always, of course, only a make-weight argument, tending to show that the improvements which the patentee had made were of an inventive character rather than embodying only ordinary skill. This contention is in each case of more or less importance according to the circumstances of that case. The court below gave this general acceptance some weight in reaching its conclu-

sion sustaining the patents; but it is never, by itself, of controlling importance.* We doubt whether this Court has ever reversed a Court of Appeals because this Court thought that court, in deciding a question of fact, to have given too much weight to one of the subordinate evidential facts.

Let us see what the supposed conflict was. The Master found that the "structures of none of the pistons in suit have ever gone into commercial use." (R. 1182.) The undisputed evidence was that pistons made by the licensees under Gulick and Maynard (and—in denial of the patents—by the Sterling Company) and in forms held by the Court of Appeals to be within the patents, had come into very general use in the industry and were counted by tens of millions. The finding of the Master, if it is to be reconciled with these undisputed facts, therefore *must mean* that the *precise and exact form* which happened to be shown in the patent office drawings of Gulick and Maynard did not go into general use.** Such superficial conflict as there is between the finding of the Master and the conclusions of the Court of Appeals is therefore nothing but a *question of law* as to whether general acceptance by the industry of a form embodying the principles of the patent and infringing the patent ceases to have evidential force of utility and novelty just because relatively trifling changes or improvements have

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* The Court of Appeals said: "These [rules] have proved helpful, even though never absolute (R. 2387) * * * It is, of course, axiomatic that commercial success is not of itself conclusive upon the question of novelty or invention." (R. 2388.)

** Even with this construction it is not true as to Maynard, which, in the precise form, was used in large numbers before the licensees made some changes which, from the patent standpoint, were trifling and immaterial, but which petitioners slavishly copied.

been included. Upon this question of law the Master was wrong; the Court of Appeals was right.

Thus it appears that on this record no possible question arises as to whether the Court of Appeals had the power and the right to find that there had been general public acceptance; the Master had made no fact decision to the contrary. However, the conclusion which is sometimes drawn from *Adamson v. Gilliland,* that the finding of a Master, supported by some testimony, is as sacrosanct as the verdict of a jury, is an unfortunate fallacy. We relegate a discussion of it to our Section II.

Clearly, this "reason" does not reach the question whether the Court of Appeals was bound to follow the Master's conclusion about anticipation by Long, or abandonment by Gulick, or anything else not alleged in the petition as a "reason."

PETITIONERS' "REASON" NUMBER THREE.

This was (petition p. 11) only that the Court of Appeals had erred in holding that the presumption of validity, as fortified here by the repeated Patent Office decisions, should prevail unless overthrown by "clear and cogent evidence," and that this was error because these fortifying decisions had been founded on a legal basis inconsistent with *Permutit v. Graver.* This is only another way of stating the first "reason," viz., that these decisions involved an unauthorized dependence upon the unaided drawings rather than upon the specification with appropriate aid from the drawings. This point has already been fully discussed; in truth, these decisions did not, to any extent whatever, rest upon the drawings alone; they rested upon the description of the operation which the specification gave and which was at once completely

informative, calling upon the drawings only to show the general structure and the physical interrelation of the parts.

Clearly, this "reason" does not reach the question whether the evidence of anticipation by Long was sufficiently "clear and cogent,"—or any similar question.

The foregoing considerations are believed to make it clear that the three "reasons relied upon" in the petition find no such basis in this record as justifies petitioners in the greater part of the discussions found in their brief. We have briefly summarized our positions for the purpose stated; and we believe this brief could properly stop here. However, lest the Court might not agree, we proceed in the following Section II to greater detail in the subjects already discussed,—avoiding repetition as much as possible,—and in the form of answer what is said by petitioners on many specific subjects.

SECTION II.—ANSWER TO PETITIONER'S BRIEF.

The Specification of Errors Assigned and Urged by the petitioners relate to the general law; they are not particular or confined to patents or the patent law. A patent is a contract and the requirements of a sufficiency of disclosure of the subject matter covered thereby is primarily a contract question. The weight to be given the Master's views against those of a Circuit Judge, or a bench of Circuit Judges (or three benches of Circuit Judges, as is the case here on disclosure) is, on its face, a general law question. Whether or not the recognized presumption of validity of a grant affirmed by one or by three appeal Courts, as affected by a later decision of this Court, is a general question by no means peculiar to the patent law. These things being so it follows, as a matter of course, that whether or not the Circuit Court of Appeals in the Sixth Circuit was

right or wrong in reversing the District Court is a matter of general, and not of patent, law.

In these premises we have little to say here as to the validity or infringement of the patents in suit. If any such question is to be considered here under any of the errors assigned, we cannot hope to do better in so short a space than refer this Court to the discussions of Judge Simons (R. pp. 2381 to 2395) who wrote the opinion for the Sixth Circuit Court of Appeals (Judges Hicks, Simons and Allen). As stated by the Court in the beginning of the opinion, that Court had recently considered two lengthy records relating to internal combustion engines to which the patents in suit here relate. Judge Simons had considered both records and written both opinions. Therefore, at the time he wrote the opinion in the instant case it would have been difficult to have found a Judge so well informed and skilled in the art to which the patents in suit here relate.

A reading of Judge Simons' opinion in the instant case not only shows that his conclusions are based upon the patent law as early established and long followed by this Court,* but his opinions in the other two cases (*Waukesha v. Willys-Overland*, 77 Fed. (2) 906 and *Perfect Circle v. Hastings*, 88 Fed. (2) 813) show that his holdings on questions of validity and infringement in the art to which the patents in suit relate, were as strict as those followed by this Court in its recent decisions and that in its opinion in the instant cause the Sixth Circuit Court of Appeals was following the requirements of high standards for patentable invention followed by this Court.

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* On the presence of invention—*Expanded Metal v. Bradford*, 214 U. S. 366; *Tempco v. Apco*, 275 U. S. 156, 161; *Smith v. Snow*, 294 U. S. 1. On new combination producing new result—*Expanded Metals v. Bradford, supra; Webster v. Loom Co.*, 105 U. S. 580. Careful consideration by the Patent Office strengthens the presumption of validity—*Radio v. Radio, supra; Hildreth v. Mastoras*, 257 U. S. 27, 32. Prior uses must be established beyond a reasonable doubt—*Barbed Wire Case*, 143 U. S. 275. The prior art cannot be modified to change its operation—*Topliff v. Topliff*, 145 U. S. 156.

PETITIONERS' POINT I.

WEB FLEXIBILITY AND PERMUTIT v. GRAVER FURTHER DISCUSSED.

The Sixth Circuit Court of Appeals did not add web flexibility as a new element under the patents; it only found that this flexibility was an inherent property of the structure described and shown. The reference to rigidity of the webs in the original Gulick specification is fully satisfied by applying it to the vertical rigidity which did exist rather than to the horizontal rigidity which did not exist. The amendment to the specification only clarified what was already apparent from the original language, and described a property inherent in the webs and known to everyone skilled in the art, as both the petitioners' and respondent's experts testified.

We have already pointed out the nature of these questions and that they had been passed upon and our contention approved by an impressive array of administrative and judicial opinion. We continue more in detail.

No rule of contract law requires that a contract shall describe the features which are inherent in the thing described. A contract for the sale of a cow would not require that the contract state that the cow had a heart or a hide or an udder. All of these things are inherent in every cow. Likewise, the patent law does not require that a patentee shall describe all of the properties that are inherent in a metal web. There was no more reason for stating that the webs are flexible than there was for saying that they were hard, or heat resistant, or heat expansive or durable, etc. ad infinitum, to the last known property of a metal web, all of which are just as essential to the successful performance of the piston as the flexibility of the web. If all of the things inherent in the cow had to be described and all of the inherent properties of the metal parts of a machine had to be described, contracts regarding cows and

patent specifications regarding machines would be endless; it would be just as futile and as endless since it would be merely announcing what was otherwise inevitably known to those versed in those arts. The net result would be confusion through unnecessary verbosity.

We ought not to have to cite any testimony to prove that a web such as shown at 17 and 18 in the Gulick patent and at F in the Maynard patent would be flexible transversely when made of metal. The merest tyro in mechanics would know that it would be, and inherently so. Nevertheless, since this point was urged through the Patent Office Tribunals, through the Court of Appeals of the District of Columbia, through the Court of Customs and Patent Appeals, and raised again in the Courts below, we made specific inquiry on the subject from the experts of both parties. The expert for the petitioners, as well as the expert for the respondent, answered that such webs as were illustrated in the original drawings and described in the original specifications of the Gulick and Maynard patents would be inherently flexible if the piston were made of any metal of which pistons were made or could successfully be made.

It is true that some specific questions asked of the experts mentioned only the drawings, and did not expressly refer to the specification; but it is plain enough that these references are merely to the structure which was described in the specification and illustrated in the drawings. It is a distortion of their testimony to suppose that they intended to say that the particular size and shape of the web itself, as indicated by the drawing, was the basis for their finding of inherent flexibility. The fact that, as described in the specification, it was intended that the slot should close, necessarily underlies and permeates all the thinking of counsel and experts and all the questions and answers along this line.

Respondent's expert, Dr. Jeffries, said:

"Q. State whether or not it would be possible in your opinion to make a piston out of any metal employed for making internal combustion engine pistons and conforming to the drawings of the Gulick patent, without having flexible webs?

A. No, it would not be." (R. p. 201.)

Mr. Stellman, one of petitioners' experts and long the Chief Engineer for the H. H. Franklin Automobile Company, said:

"Q. That is, with your knowledge of the piston industry you would know by looking at the drawings (of the Gulick patent) that those webs would be flexible if the piston was made of material of which you ordinarily made pistons?

A. Yes." (R. p. 568.)

"Q. Referring to the Long patent 1,489,499, I believe you said the webs 8a would be flexible.

A. To a certain degree I should say they would.

Q. And in saying that you assume the piston would be made of the material ordinarily employed in making pistons?

A. Yes.

Q. And the same thing would be true of these webs 17, 18, and 19 in the Gulick patent, wouldn't it?

A. Yes." (R. p. 568)*

We recognize the rule that an inventor may not add new matter to his specification, which is the rule stated in the authorities relied upon by the petitioners,** and we have

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* In common with a practice followed by most piston patentees, Long did not describe his webs as flexible in his patent No. 1,489,499 or in any other of the several Long patents cited in the record and relied upon so heavily by the petitioners as prior art. (R. pp. 1727, 1731 and 1735.)

All the Patent Office tribunals, and the Court of Customs and Patent Appeals (47 Fed. (2) 365 and 367), held that Gulick antedated Long. (R. pp. 1537, 1539, 1545, 1553, 1561, 1569 and 1571.)

** *Powers-Kennedy v. Concrete*, 282 U. S. 175; *Railway v. Sayles*, 97 U. S. 554, 563; *Permutit v. Graver*, 284 U. S. 52.

no quarrel with that rule, but the rule does not apply to a superfluous amendment of a specification or to the failure to make a superfluous amendment to a specification to describe a property known to be inherent in an element which is illustrated and described. Amending the Gulick specification, which says that the skirt is flexible, to say that the web, which supports the skirt, is flexible, is equivalent to amending a contract regarding a cow to say that the cow has a heart or a hide.

If the authorities cited by the petitioners made any such rule as the petitioners contend, not only would all patents be invalid for insufficiency of disclosure (for none describe all of the properties of all of the elements disclosed therein), but if such rule were extended to contracts, every contract would be invalid, for no contract describes all of the properties of the subject matter covered thereby any more than do the issued patents. If these authorities made the rule, as petitioners say they do, then every decision which has sustained a patent would be wrong because no patent ever sustained described all of the properties inherent in all of the parts. Such a rule would, on its face, be childish because it would burden patents and other contracts with endless and useless verbiage. The rule would be particularly puerile when applied to patents because the properties of elements, such as inherent flexibility of a web, are so well and commonly known to those skilled in the art. Moreover, such a rule would make requirements contrary to the patent statutes which have held that a patent disclosure is sufficient if it is sufficient to instruct those skilled in the art. (U. S. R. S. 4888.) Both the expert of the petitioners and the expert of the respondent in this case were skilled in the art and the patent specifications and drawings involved taught each of those that the webs were inherently flexible.

Such a rule would be particularly disastrous to prior public uses and like prior art other than patents or publications since public uses and like prior art are seldom accompanied by a contemporaneous description at all, and never by descriptions describing such inherent properties as the flexibility of a thin metal web for the very cogent and very simple reason that everyone familiar with such things knows without being told that such is the property of such a web.

In these premises it would be immaterial if this Court had—which it did not—made the incongruous rule that petitioners claim it did in *Permutit v. Graver*, 284 U. S. 52. To say that a disclosure by a drawing alone is insufficient to teach those skilled in the art to which that drawing relates would fly in the teeth of the truth as established by history both ancient and current. The use of drawings as a means of disclosure preceded by many centuries the invention and use of written language. During these many centuries record disclosure was through drawings alone and it was eminently successful; indeed, it is by no means uncertain that the letters used in the first writings were not merely abbreviations of drawings. In every engineering and mechanical art existing today communications are made between those cooperating in the work, such as the engineering and constructing department, through drawings, called blueprints, almost to the exclusion of either written or spoken language. Disclosures by which every constructing man, including those who build skyscrapers, bridges, and other large structures, are received from the designers through these blueprints. We dare say that every one of the hundred million pistons built under the patents in suit were built from blueprints furnished by the designers of the pistons to the builders *de hors* any other description, written or oral. (R. p. 1051.) From the very beginning of the patent practice, the Courts, in considering

prior art devices, have often had before them no other contemporaneous recorded disclosure than that contained in drawings and many patents have been held invalid on disclosures made by drawings alone.

A reference to general contracts emphasizes the impracticability of the proposed rule. Many construction contracts relating to the building of houses and bridges identify the things to be done by drawings attached to the contract. Would the contract be invalid as indefinite because the inherent properties and features of the building or the bridge, or of the materials from which they were formed, were not described in the text of the contract in addition to being illustrated in the drawing and, if so, to make the contract valid would it be necessary to describe the properties of each of the materials of which each of the elements of the building or the bridge were constructed? If a farmer and an agricultural dealer entered into a contract regarding a harvester, illustrated by a drawing attached to the contract, would the contract be invalid if the reel, or the sheath-carrier, or the driver's seat were not described in the text as well as illustrated in the drawing and, if so, would it be necessary, to make the contract valid, to describe the properties of the materials of which these parts were made, although those properties were well known to any farmer or any agricultural dealer who looked at the drawing?

If it were the rule that a drawing adds nothing to the specification, and cannot be at all relied upon where the descriptive language is not complete in all details, then the addition of the drawing would be a useless thing to do. It will not be presumed that the law requires a futile act. Each supplements and perfects the other.

When the instant case is squared with this practice it is found that it would be impossible for anyone making a piston to make it following these drawings (even with no aid from the specification) without making the webs flexible

in the horizontal and rigid in the vertical. (R. 201, 568-9.) As we have said, however, we need not resort to the truth that the drawings were a sufficient disclosure, because the specifications also described the webs, and both experts agree that they would be inherently flexible.

We recognize the rule—and this seems to be the rule in *Permutit v. Graver*—that an element included in a patent disclosure, either through the drawing alone or through the drawing and the specification both, cannot be read out of the disclosure and something else read into the disclosure in its place. As we understand the situation in *Permutit v. Graver,* this Court thought that the patent disclosed a "locked" zeolite bed or a bed in which the zeolite was locked, and that this "locked" bed was read out of the patent and a "free" bed read into it. This refers to structure. We recognize that such a rule is a proper rule when applied to structure and one well grounded in the patent law. No such situation exists in the instant case; in the Maynard patent there was never any change and, therefore, as far as that patent is concerned, there is no ground for even a specious argument that the rule applies to it; in the Gulick patent the original disclosure referred to the rigidity of the webs as "in addition" to the slot in the skirt supported by the webs, in language which the merest tyro in the piston art would recognize as meaning rigidity in the *vertical* plane and not in the horizontal plane. To say that this language meant rigidity in the horizontal plane, as petitioners contend, and must so contend to come even within the shadow of the rule in *Permutit v. Graver,* is inconsistent not only with the language, but also with the disclosure that would be made even by the drawing alone to any one skilled in the piston art.

There is nothing irreconcilable in rigidity and flexibility when in the same web or sheet of metal unless one tries to

read both terms as operating in the same direction. The application of a bit of common sense makes it clear that when read in different directions there is nothing to reconcile; all is plain.

Be that as it may, the fact is that Gulick described his piston as flexible and, in addition to being flexible, as also rigid and that both rigidity and flexibility are inherent in his piston structure. Dr. Jeffries, respondent's expert, said:

> "He (Gulick) does have a rigid piston *longitudinally* and a flexible piston laterally." (R. p. 150.)

If, although flexibility is inherent in Gulick's web, we must show that flexibility therein was described in Gulick's original specification, we say:

Gulick described the structure of these connections from the power transmitting bosses to the piston skirt as "flanges 17" which extend laterally from the bosses "in the form of webs 18." He described the structure of the connection of the "webs" to the skirt and to the piston head. He described the mode of operation of his piston as embodying a skirt slightly separated from the head of the piston and split longitudinally at 21 "so that it would not expand *in circumference* with a force great enough to cause the piston to stick in the cylinder." He described the piston as a whole as adapted not to "expand against the cylinder wall to such an extent as to seize or stick." He also said that, *in addition* to providing the *piston with a skirt* that was separated from the head and was split so that it would not expand from heat an undue amount under operating conditions, the construction of the webs previously described by him also provided an extremely rigid connection between the piston pin bosses and the skirt of the piston. He also described the arrangement of the supporting flanges or webs as providing "a particularly strong support for the bosses."

Therefore, Gulick, in his original application,* *described his structure as both rigid and flexible.* He said that *in addition* to this flexibility of the piston skirt, he *also* provided an extremely rigid connection between the bosses and the skirt. Having described the piston as a whole and the skirt in particular as flexible in the direction of the pressure from the cylinder wall, it seems to us that it was unnecessary for him then to say that each part of the supporting structure that carries the bearing or working faces of the skirt was flexible or what degree of

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* As to the functional operation of the piston in an engine cylinder, the Gulick application as originally filed said (R. 1837-9):

"One of the objects of the present invention is to provide a piston which is not adapted to expand against the cylinder wall to such an extent as to seize or stick.

"Another object of the invention is to provide a piston with a skirt slightly separated from the head of the piston and split longitudinally so that it will not expand in circumference with a force great enough to cause the piston to stick in the cylinder."

"Another object of the invention is to rigidly support the piston pin bosses of a piston from the piston walls." * * *

"These flanges extend laterally of their respective bosses in the form of webs 18 which integrally connect with the wall of the skirt * * *."

"Thus, the bosses are connected to both the head and the skirt so that the latter is held in its proper position directly beneath the head as shown in Figs. 1 and 2."

"In order that the skirt may not expand an undue amount when the piston is heated, as under operating conditions, it is split longitudinally as at 21."

"It will be seen that in addition to providing a piston with a split skirt, the above described construction also provides an extremely rigid connection between the piston pin bosses and the skirt of the pistons, * * *"

"The arrangement of the supporting flanges 17 between the ends of the piston pin bosses and the connections of those flanges with the piston skirt provide a particularly strong support for the bosses."

flexibility was required of each part during different conditions of operation or to describe the other inherent properties of the structure in any more detail than necessary to instruct those skilled in the art how to make a piston having the structure necessary to obtain this mode of operation and the results of Gulick's invention. The instruction given was definite and certain.* Those skilled in the art, as were the two experts, were unable to produce anything other than a piston that, as Gulick originally said, is rigid in one direction and flexible in another direction, as their previously quoted testimony shows. There is no evidence and no finding that those skilled in the art were unable to make the piston from the disclosure originally given or that a different piston would be made when the workman was told that the webs were flexible. The disclosure was complete. The change made by amendment was in words only, not in substance. Both petitioners and respondents produced pistons made in accordance with the patent. (Ex. 3-T, R. p. 240; Ex. 20, R. p. 155.)

A patent application, as any other written document, must be taken as a whole in construing its parts. The description of the flexibility in one direction can not be construed as meaning flexibility in all directions without running afoul of the description of rigidity. The description of rigidity as "in addition to" the flexible property of the piston, cannot be read to exclude flexibility. To assert that one must be accepted and the other rejected is to fly in the face of the clear and unequivocal meaning of the description when read as a whole, just the same as any other document is read and construed.

Both of these things are true as to the Gulick piston, just as Gulick originally described them and, as the ex-

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* R. pp. 150, 151, 193, 577 to 579, and 1071. There is no evidence to the contrary.

perts said, it could not be made otherwise if the drawings were followed. As the Court of Appeals said, speaking through Judge Simons:

> "The wrist pin bosses * * * are carried from the piston head by depending flanges, thus providing a vertically rigid support for the bosses with freedom of lateral motion in a direction at right angles to the load thrusts on the piston." (R. p. 2385.)

The Gulick construction provides a connection between the bosses, the head of the piston and the bearing faces of the piston that is rigid in the plane of the connecting webs, "so that the latter (the skirt) is held in its proper position directly beneath the head." The separation of the bearing face of the piston skirt from the head and the split of the bearing face between the connections of the bearing face to the piston bosses, were arranged so that the skirt would not "expand in circumference with a force great enough to cause the piston to stick in the cylinder" during operating conditions. The lateral flexing of the webs, or "the freedom of lateral motion" as the Court of Appeals said, in a direction at right angles to the power thrusts applied to the piston permitted this operation without detracting from the rigid and unyielding character of the web construction in the direction of the terrific power thrusts on the piston.

As the record shows (R. pp. 589, 920, 962, 1077, 1079 and 1080), two vital and essential things in a piston were ruggedness and durability. The axis of the head that carries the sealing rings must not move away from the axis of the cylinder because this would cock the head of the piston in the cylinder and result in failure of the piston. The powerful side thrust from the bosses to the bearing walls of the piston, produced by the angularity of the connecting rod during the power stroke, must not cause the bosses to move in the direction of the cylinder wall because that would tilt the head of the piston at an angle and

the head would stick or seize in the cylinder, breaking up the piston and probably the motor, with all of the other attendant disadvantages incident to what is described as "weaving" of the piston head. (R. 61-63, 109, 1079 and 1080.) It was essential that these connections from the power transmitting bosses to the bearing walls and to the head of the piston be made rigid enough to transmit these explosive car-driving blows, delivered sixty or more times each second, through the piston to the connecting rod and the engine shaft. In other words, the skirt must remain "in its proper position directly beneath the head." Any relative movement between the bosses and the bearing faces of the piston skirt would result in disaster. This requirement for rigidity was limited to the direction of application of the driving forces working on the piston.

Gulick disposed of the heat problem by creating within the piston structure what amounted to a heat and pressure operated engine, through which the effect of the heat on the expansion of the piston was neutralized by the reaction of the cylinder wall pressure through the oil film to the piston skirt and so as to prevent the skirt from expanding against the cylinder wall to such an extent as to stick or seize.

Petitioners rely heavily, if not exclusively, upon the following sentence which was in the original Gulick application:

> "It will be seen that **in addition** to providing a piston with a split skirt the above described construction **also** provides an extremely rigid connection between the piston pin bosses and the skirt of the piston, which construction may be used either with or without the split skirt and separated head."

It is contended by the petitioners that the rigidity referred to in this sentence meant, or at least included, horizontal rigidity; it is the contention of the respondent that it referred to vertical rigidity only.

The respondent's position is that

(1) Since the functions of a sheet or web of metal are so well known, there could be no ambiguity or no confusion and that anyone, whether skilled or unskilled in the art, who knew anything about the properties of a sheet of metal would know that the rigidity refers to the property in the vertical plane because by the very nature of the sheet it could not be rigid in any other plane.

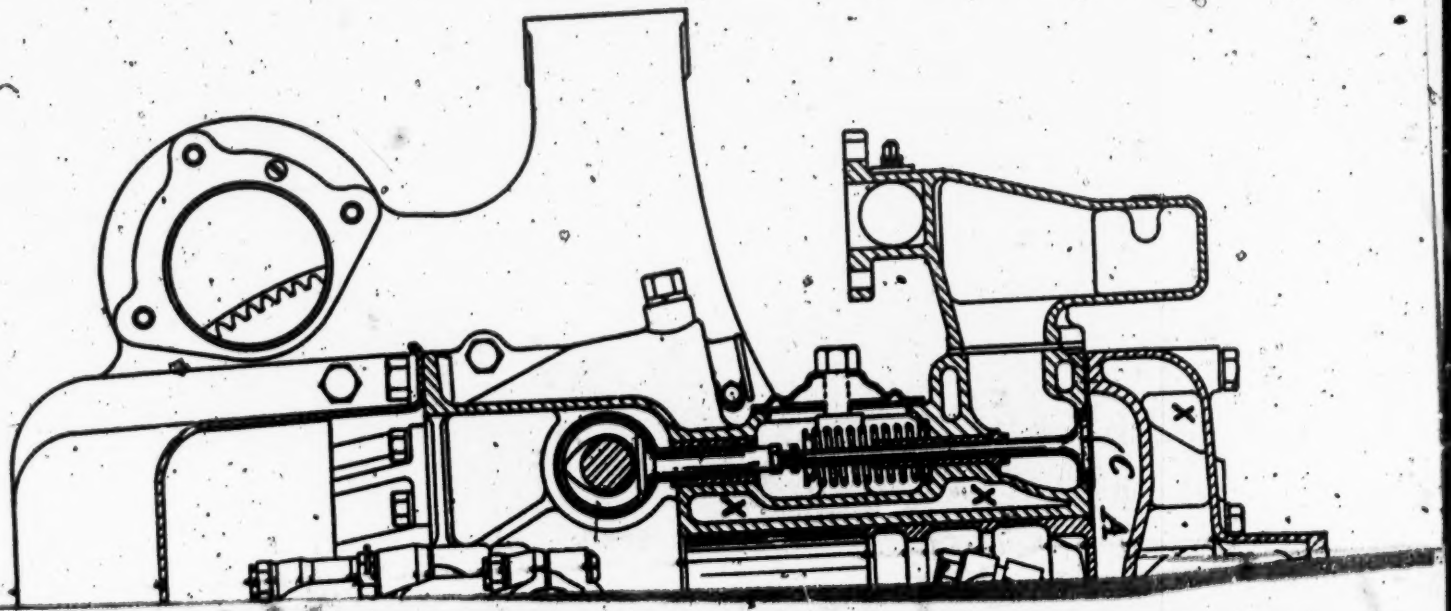
(2) That since the sentence contains the term "split skirt," horizontal flexibility would not only be inherent in the structure, but would be unavoidable. If there could be any doubt about this, other portions of the specification to which we have already referred make it indubitable.

(3) Aside from these things we assume that if it be held that there is an ambiguity in the above quoted sentence, nothing can throw more light upon it than the sentence in the specification next following the one quoted and in which Gulick stated the purpose of the rigidity. This sentence is as follows:

> "The arrangement of the supporting flanges 17 between the ends of the piston pin bosses and the connections of those flanges with the piston provides a particularly strong support for the bosses."

The reader of these two sentences must bear in mind that by far the greatest forces between the piston and the piston rod, and hence between the bosses and the webs or flanges 17, are in the vertical. The explosion which impinges against the top of the piston drives it vertically downward. The force of the explosion is transmitted vertically downward through the bosses and the webs or flanges 17 to the connecting rod and thence to the running gear of the vehicle.

This will be clear from the cross section of an internal combustion engine illustrated in Fig. A opposite page 40 of our Main Brief in the Court of Appeals.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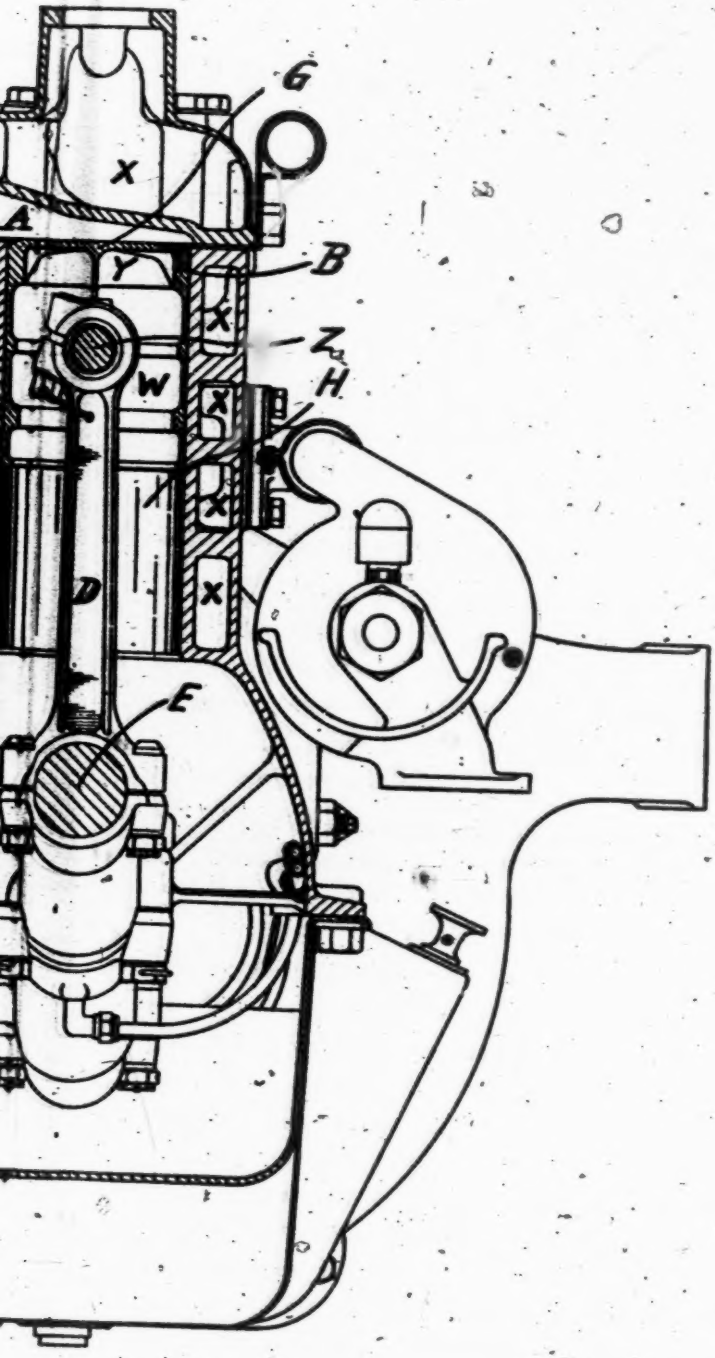

FIG. A

The explosion occurs in the chamber A, impinges on top of the piston head G, drives the same *vertically* downward in the engine cylinder H, as the explosion of the powder in a gun drives the bullet down the barrel of the gun. The piston is connected through a rod D and a crankshaft E with the running gear of the car. As everybody in the art knows *these connections between piston and car gear must be rigid in the vertical.*

In endeavoring to limit the discussion to the property of expansion and contraction of the piston horizontally, petitioners, throughout their presentation of this cause in all of the Courts, have minimized or lost sight of the need of preserving ruggedness and durability in the piston as a prerequisite to horizontal flexibility. The testimony of Mr. Gulick shows that he had these virtues particularly in mind. As the Court of Appeals said (R. p. 2390):

> "While Gulick variously expressed satisfaction with the performance of his experimental pistons, it is clear upon review of his entire evidence that what he had then in mind was that they performed satisfactorily in reference to clearance. They had not demonstrated their strength and durability, or that they were properly designed or machined for commercial use."

When these things are considered it becomes clear that the two sentences which we have quoted are dealing with these essentials which, of course, were predicated primarily upon a rigid connection in the direction of the applied power, i.e. in the vertical between the piston and the connecting rod through the bosses and the webs or flanges. The draftsman of the specification knew that everyone would know that the web or sheet would be flexible in the horizontal. He knew that if the skirt were split there would be no way of preventing the operation of this

flexibility, even if it were desired to prevent it. Those things were known not only to those skilled in the art, but to anyone who knew the properties inherent in a sheet of metal. He also knew that those skilled in the art would be concerned about the preservation of the ruggedness and durability of the piston, at the very bottom of which there lay the question of rigid connection between the piston and the piston rod. The connections between the piston and the piston rod which had been in universal use prior to Gulick's invention, and which were relied upon for rigidity and consequent ruggedness and durability, had been discarded in his piston in order to provide a means which would flex in the horizontal. It was, therefore, important that this feature of vertical rigidity should be described. The horizontal flexibility of the webs was inherent and apparent to anyone skilled in the art. The vertical rigidity of the new piston, however, was not. Hence, we find in the first sentence a reference to this "extremely rigid connection," and in the second sentence a description of its purpose, i.e., the provision of "a particularly strong support for the bosses" which, as everyone who knew anything about pistons could only interpret to mean against the strong vertical forces by which the vehicle was propelled through these connections. All this is borne out and supported by the drawings which show the webs 17 extending almost the entire length of the piston skirt and projected upwardly and downwardly to brace the central part of the webs against forces applied in the vertical.

Many of the opinions of the Patent Office Tribunals were rendered at different times when considering different claims of the Gulick patent. In all, thirteen concurring opinions have been rendered by eight different tribunals. Six claims of the Gulick patent, found valid and infringed, were involved in these long and bitterly contested interferences in the Patent Office and on three appeals from the Patent Office. The long delay in obtaining the Gulick pat-

ent was caused by the persistent efforts of later contenders to wrest from Gulick the rights which the Patent Office and the Administrative Courts believed belonged to Gulick. No appeal was ever taken by Gulick in the Patent Office.

In no instance was any opinion based upon the particular measurements of the Gulick drawings. They were each based upon Gulick's structural arrangement of the elements of his piston and his disclosure that, in addition to the rigid construction for the one purpose, his piston skirt would not "expand against the cylinder wall to such extent as to seize or stick" for the other purpose of maintaining a minimum of clearance between piston skirt and cylinder wall.

Special Proportions of Variants and Special Embodiments of the Patented Pistons: Counsel recognized, and must early have done so, that not only was flexibility inherent in the webs, but that the dimensions of the webs must be varied—not to get flexibility—but to get the degree of flexibility most efficient for each variant. Hence there was considerable cross examination of respondent's expert on the latter question and his answers were in the Court below, and are here, used in such a way that the latter proposition is confused with the first one (see Petitioners' brief, pp. 31-34).

Every important invention is capable of being constructed in numerous designs varying in size, materials and within wide limits in details and dimensions. Into this picture comes the engineer who calculates the strains, the forces, the loads, etc. and proportions the parts of each set of details and dimensions to realize the greatest efficiency in that particular design.

Not only was Dr. Jeffries interrogated on this subject, but special designs, such as the Ricardo piston with the

slippers split, were submitted to him and he did the best he could, without slide rule, engineering tables, etc., to advise counsel on how to proceed to proportion the parts of these designs to apply the Gulick and Maynard principles to them to get the best efficiency.

Attempt is now made to construe this testimony to mean that there is an insufficiency of disclosure because Gulick and Maynard do not do their engineering in their specifications along with their disclosures.

A patentee is not required to do his engineering in his patent; he is not required to do more than disclose a single embodiment of his invention (*U. S. v. Societe*, 224 U. S. 328).

It does happen that Maynard did do his engineering in his patent as well as in his disclosure since, as the record shows, millions of pistons exactly like shown in his patent drawing were successfully used in commerce. (R. pp. 462, 471, 68, 955, 1050 and 1328.)

The Gulick patent does likewise, since, as the record shows (R. p. 699), Gulick was a skilled engineer and the Gulick patent drawings disclose an experimental piston designed by him to get the best results for that design. (R. pp. 719 and 1363.)

What would be the best proportions to be given the parts of other variants, such as the Ricardo piston with the slippers split, can have no bearing on the disclosures of the patents in suit or the issues here. A proposition that a patentee must not only do his engineering in his specification, but must do it for all the variants on the embodiments he discloses would be asking the impossible, and to contend that his patent is invalid because he does not do so is not only unreasonable, but contrary to all authority and all practice.

Yet the Master was confused by this contention; Judge Simons was not.

PETITIONERS' POINT II.

The Circuit Court of Appeals did not treat the Maynard webs as essential elements, but merely as elements of the combination illustrated in the Maynard patent as the preferred form. That Court did not undertake to read "flexible webs in the region of the wrist pin bosses" as essential elements or as, in fact, any elements at all in the Maynard claims which recite webs without any such limitation as petitioners assert. In asserting that Maynard used flexible webs in the piston which he illustrates as his preferred form, the Court of Appeals relied upon the commonly known fact that the webs were flexible in the horizontal and the testimony of the petitioners' expert, as well as that of respondents' expert, to the effect that they would be inherently flexible to common knowledge.

Point II, made and discussed by the petitioners at pages 35-38 of their brief, is different from Point 2 at page 15 which seems to be its Point III discussed beginning at page 38. We will follow the discussions under the order of the Roman numerals.

Under this title (Point II) petitioners try to read into the Maynard patent in issue and into the cause, a feature not recited there and unimportant to any legal issue or to the operations and results of the pistons. So long as the webs are flexible it does not matter that they are not so in "the regions of the wrist pin bosses." Whatever is true of the Maynard piston in this regard is true of the defendant's construction except, perhaps, in degree, as petitioners' expert repeatedly testified (R. pp. 566 and 581), as respondent's expert affirmed (R. pp. 122-125, 127, and 953-955) and as the attached drawings conclusively exhibit. (See page 52 of this brief.)

Moreover, as the evidence we have cited shows, both pistons have flexible webs and both webs are flexible in "the regions of the wrist pin bosses."

The second question discussed by the petitioners under the title "Point II" relates to the rule that a patentee is not required to give directions as to how to design pistons embodying his invention in its various applications. This question was also discussed by petitioners under Point I and our reply will be found at the end of our preceding chapter entitled "Special Proportions of Variants and Special Embodiments of the Patented Pistons."

No Finding of Fact was proposed to or adopted by the Master* that had the slightest bearing on the sufficiency of the disclosure of either the Maynard application as filed or the patent as issued.

Nowhere is there any evidence that the Maynard patent in suit was insufficient to teach those skilled in the art how to make and use the invention of the Maynard patent.

PETITIONERS' POINT III.

The evidence of the petitioners' experts alone was sufficient to justify the Court of Appeals in finding that the aluminum piston problem was solved by the patents in suit and that the commercial success of the aluminum piston was due thereto.*

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* All findings and conclusions on the merits were proposed by Petitioners and adopted by the Master without change.

* R. pp. 458-462, 464, 465, 467, 468, 469, 471, 478, 479, 481, 528, 529, 531, 535, 537, 540-548, 551-555, 560-563, 566, 567, 568, 572, 573, 574, 577, 578, 581, 582, 587-589, 1073, 1074, 1077, 1079, 1080, 1081 and 1082.

CONFLICT BETWEEN MASTER AND COURT.

There has been no violation in this cause of the rule in *Adamson v. Gilliland* (242 U. S. 350) either as announced by this Court or asserted by petitioners. The points upon which the Court of Appeals differed with the Master were points (1) upon which there was not a scintilla of evidence to support the Master's finding, (2) law points, and (3) points on record evidence.

The question of sufficiency of disclosure is one based on the records and in such case there is no presumption in favor of a finding of a Master or a District Judge; indeed, the Court of Appeals was much better equipped, because of Judge Simons' experience in such matters, to come to a just conclusion on this subject on the record than either the Master or the District Judge. If the testimony of the two experts to the effect that the webs would inherently be flexible is to be considered then, since they are in agreement, there is not a scintilla of evidence to support the Master and the District Judge on this subject.

The extensive commercial use of the precise piston illustrated in the drawings of the Maynard patent was testified to by Mr. Stellman, petitioners' expert, as well as by Dr. Jeffries, the expert for the respondent.

Mr. Stellman said (R. pp. 462 and 471):

"In general design, the pistons that were furnished by the Aluminum Company, Bohn and Kant Skore, to manufacturers, were like that shown in the drawing of the Maynard patent 1,655,968, in this suit, but I don't know that they were slotted like that. I know that that piston shown in the drawing, and commonly known as a split skirt piston in the industry, was used in quantities since around 1921."

"I can't tell you when I first saw pistons like shown in the Maynard patent, with the slot. I should say they have been on the market, with the slot in them, for a number of years, and in wide use, not only for replace-

ments, but in production by a number of automobile companies."

(See also R. pp. 68, 71, 77, 78, 81, 88, 130, 132, 135 and 955.)

There is not an iota of evidence to the contrary. Counsel have made the mistake of asserting the contrary so often that it may by now be classified as self deception, especially in view of the effort to drag a herring across the trail by reference to Dr. Jeffries' testimony regarding a slight variant with the inference, if not the suggestion, that there is no other evidence on the subject. (Petitioners' brief, p. 41.)

That it is the rule that a patentee may rely for commercial success upon embodiments of his invention other than those illustrated in his drawings, as well as the latter, does not daunt petitioners, who insist that every patent must be limited to what is specifically illustrated and not then unless every property of every part is described in the specification as well. Courts are not so harsh even with criminals; certainly public benefactors are entitled to a more liberal treatment. Presuming that such a harsh rule will be adopted by this Court against all preceding holdings, counsel says that the Gulick piston was never used commercially. That is like saying that none of Alexander Graham Bell's telephones were ever used. About a hundred million Gulick pistons were used in the sense that Dr. Bell's telephones were used.

Whether or not Maynard advanced the art is a legal conclusion and no presumption favors a Master's finding on that subject. Since Maynard illustrates a piston made by the millions and which petitioners found it necessary to duplicate to succeed in the commercial field (R. p. 1074), the legal conclusion of the Court of Appeals is correct.*

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* The commercial success of the piston covered by the patents in suit was due neither to "strong hands" nor to what petitioners

(Continued on page 51)

There is not a bit of evidence to support the Master's conclusion that Maynard embodies the fundamentals of Franquist. Even the evidence of petitioners' expert is to the contrary. (R. pp. 528, 552 and 1078.)

Whether or not Maynard's combination of elements is a patentable combination is a legal conclusion with no presumption favoring the Master's finding. The finding of the Court of Appeals on the question is bottomed on decisions in this Court. (*Webster v. Loom Company*, 105 U. S. 580; *Expanded Metal v. Bradford*, 214 U. S. 366; *Consolidated v. Diamond*, 220 U. S. 428.)

Whether or not defendant's piston, Exhibit 1, embodies the invention of Gulick and Maynard is also a legal conclusion. We do not discuss it further since it is admitted in petitioners' brief that the question of infringement is not here involved. (Petitioners' Brief, p. 17.)

No evidence supports the claim that defendant employs "the essential structure, function and mode of operation" of a prior art device. Even petitioners' expert repudiates that assertion. (R. p. 567.) Any finding of the Master to that effect is not only not supported by any evidence at all, but such would be a legal conclusion and entitled to no favorable presumption.

We presume that we must say something about the "Keystone relief" mentioned so often in petitioners' brief, though this feature is not only misnamed by petitioners, but both with its proper and its improper name relates to details immaterial to any issue in the cause. It is not in-

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(Continued from page 50)

refer to as "the 'selfish' type." It was not due to any causes mentioned by this Court in *Mineral v. Magma*, 280 U. S. 400, or *Textile v. Louis Hirsch*, 302 U. S. 499, but resulted, as the Court of Appeals said, from overcoming the "black eye" given the aluminum piston by prior efforts and failures which were overcome only after tests on the patented pistons were made by engineers of internal combustion engine manufacturers who were, by such tests, convinced of the merits of the patented pistons and of their solution of the problem. (R. p. 2383.)

cluded in any claim in suit; it does not affect any mode of operation or any result of any piston involved here, except perhaps in degree, which is immaterial.

An examination of the drawings of the Maynard patent and Exhibit 1 on the opposite page of this brief will show that the edges of the reliefs shown at Y are slanted downwardly and inwardly to form a frustrum of a triangle commonly known as a Keystone. Whether the edges are so inclined or not is immaterial. The evidence shows that these sides may be vertical as in Exhibit 21 (R. p. 1337) or they may be inclined downwardly and outwardly as in the piston of the Jardine patent (R. p. 1294), without any change, except in degree. The record also shows that some users of the Maynard piston, largely for psychological reasons, objected to what appeared to be sharp edges on these Keystone reliefs in the original Maynard design. Hence they were trimmed off as shown in Exhibits 17 and 1. No doubt because of the insignificance of this change structurally, as well as in operation and results, counsel have sought to give it importance by borrowing the term "Keystone relief," employed for the Keystone relief to which we have referred notwithstanding the trimming of the edges resulted only in the removal of a triangular section and left a triangular surface where the sharper edge had been. Since the edge part removed in no way affected the principle or functions of the Maynard piston, the removal of this little triangular section did not do so either. (R. pp. 80-86, 190, 191, 199, 200, 201, 566, 581, 955, 956 and 957.) Yet this is the kind of thing that makes the hue and cry pervading this cause.

We have elsewhere in this brief discussed the "patent pool" question to which the petitioners return in the chapter entitled "Point III" and we will not discuss that subject again except to say that there is no evidence in this record to support the claim that "actually at the end of 1926 there was complete control of the aluminum piston

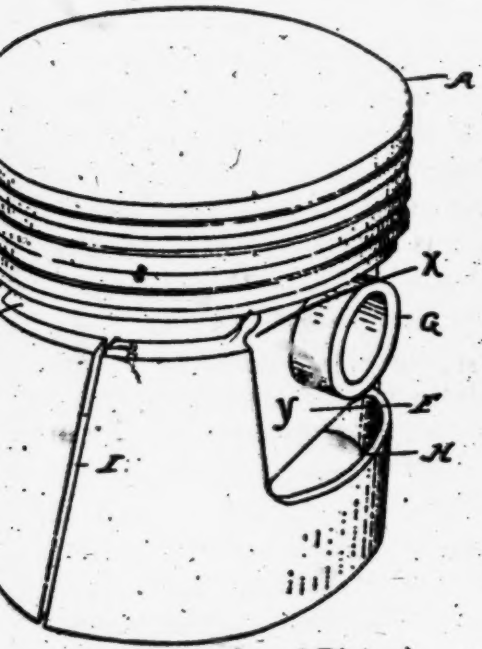

Fig. 1 (Maynard Piston)

Fig. 2 (A Piston of each Plaintiff and Defendants)

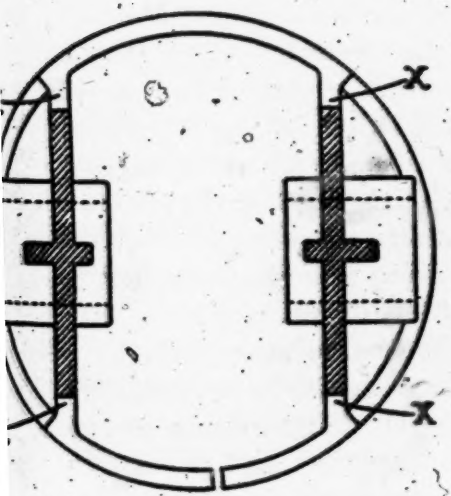

Fig. 3 (Maynard Piston)

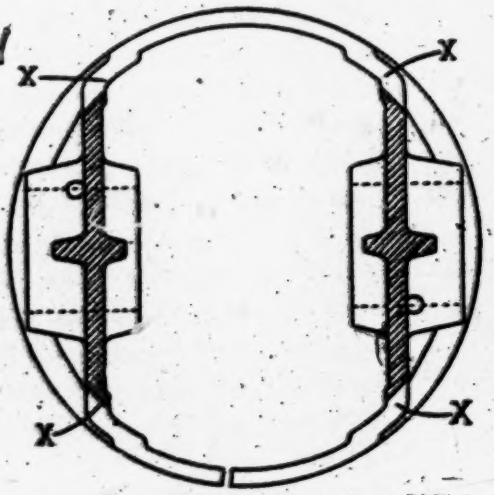

Fig. 4 (A Piston of each Plaintiff and Defendants)

business in Aluminum Company of America," since as the record shows there were several licensees under the patents here in suit and as the Patent Office records would show there are a number of aluminum piston designs covered by patents, not owned by the respondent or the Aluminum Company, available to those who would engage in a business not infringing the patents in suit. Indeed, this record includes many such patent said by petitioners to disclose excellent piston designs. (R. pp. 1667-1681, 1694, 1702.) Inconsistent is the contention that all the patented pistons are uncommercial, yet by them the aluminum piston business is monopolized. The truth lies between: the patents in suit disclose and cover commercial aluminum pistons; other commercial designs are available to the petitioners, but they want to duplicate the designs of the patentees' licensees, and have done so for years.

The Long Pistons were used in very limited quantities in the replacement trade and to some extent in a special air-cooled engine; except for a few more or less experimental pistons all were made from castings licensed under the patents in suit and were, therefore, under the patents in suit. (R. pp. 387, 461, 462, 940 and 986.) As one of petitioners' witnesses said, the use was a "mere drop in the bucket." (R. p. 399.) Long did not solve the piston problem for many reasons. Because of his defects the pistons of the patents in suit prevailed over the Long pistons in both its uses. (R. pp. 216, 359, 399, 455, 463, 986, 1438, 1587.)

Gulick preceded Long as all the Patent Office Tribunals and the Court of Customs and Patent Appeals found in completely contested interferences between the two (17 Fed. (2) 686; 47 Fed. (2) 369).

All engine makers, except the maker of the air-cooled engine to which we have referred, recognized that the Long piston was not a solution of the piston problem and rejected

it; later these same makers adopted Maynard. It was the installation of such pistons as the Long piston in private cars by garage mechanics that gave the aluminum piston the "black eye" referred to by the Court of Appeals (R. p. 2383), and which made it necessary to restrict the licenses under the patents in suit to reliable makers of pistons.

In any event, the conclusions about the limited success of Long's piston and the failure of the industry to recognize it as a solution of the piston problem are conclusions where no presumption favors the Master's finding.

Elsewhere in this brief we have discussed "intervening rights" and the Long piston.

The Court of Appeals did not base its finding of commercial success on the licenses taken or the royalties paid under the patents in suit, but on the evidence of the making, selling and successful use of a hundred million such pistons.

Licenses and royalties are evidence upon public recognition.

There is no truth in the assertion that respondent ever represented that Franquist or Spillman & Mooers were responsible for the success of the aluminum piston; all the evidence is to the contrary.* Petitioners bought these two patents, but never made any such representation regarding them. Even if such representation had ever been made, it could be of force only in case it had been shown that the petitioners had acted upon the same and there was consequently an estoppel forbidding respondent to assert the truth which is, as both experts agree, that the Gulick and Maynard inventions are not found in Franquist or Spillman & Mooers. (R. pp. 528, 529, 554, 563 and 567.) On this sub-

*R. pp. 111, 177, 178, 201 to 205, 246, 247, 496, 528, 537, 555, 929, 943, 944, 1040, 1041, 1052, 1053 and 1078 as to Franquist, and 102, 109, 167, 195 to 198, 373, 458, 553, 555, 562, 563, 567 and 573 as to Spillman & Mopers.

ject there is not a bit of evidence to support a contrary finding; moreover, any conclusion in the premises is a legal conclusion.

Other Outstanding Errors in the Petitioners' Brief: Many of the record references cited by petitioners to support their assertions are to the Master's report; this is because there is evidence to support neither the petitioners' assertions nor the Master's report. For example, there is not a scintilla of evidence to support the assertion or the holding that the Gulick and Maynard pistons never went into commercial use. Even petitioners' expert testified to the contrary, as we have said. (R. pp. 462 and 471; see also pp. 68 and 955.) When the testimony of respondent's witness, at pages 462 and 471 of the record is read, the error of the statement at pages 14 and 41 of Petitioners' brief, that the only evidence on the subject is that of plaintiff's expert, is clear.

Another like error is the statement that—

> "Before they expired Respondent represented that the pioneer Spillman & Mooers and Franquist patents were responsible for the success of the aluminum piston." (Citing the Master.) (See Petitioners' Brief, p. 10.)

The extravagance of this statement and the errors in the statement at the top of page 11 to the effect that respondent was "relying upon those patents (Spillman & Mooers and Franquist) as dominating flexible aluminum pistons" are plain from the undisputed evidence showing that neither Spillman & Mooers nor Franquist was commercially flexible. (Petitioners' expert, R. p. 562; Respondent's expert, R. pp. 108, 109, 164, 165, 195-199 and 684.)

We think it fair to assume that patents on unsuccessful devices precede the patent on the successful device or devices, and that some of these preceding patents contain

broad claims. Fifty-seven such patents preceded McCormick's successful reaper and the Wright brothers were preceded by a host of patents on flying machines that never left the ground. And so Spillman & Mooers and Franquist preceded Gulick and Maynard.* To avoid suits, which had been threatened and, under Franquist, actually instituted against one of respondent's licensees, these two patents were bought and incorporated in the group, and being there, were included in the licenses issued and the suits instituted prior to their expiration. But no suit including them was ever tried and no representations were ever made that they were successful or responsible for the success of the aluminum piston. They were so unimportant that when they expired no licensee asked for a reduction in royalties which any licensee might have done had either patent been important. Moreover, the Spillman & Mooers patent expired in 1931 and the Franquist patent expired in 1932. Yet the Sterling Company persists in copying, to their minutest detail, each of the designs of the respondent's licensees in lieu of adopting the now free and open designs of Franquist and Spillman & Mooers. To use the language of Mr. Justice McKenna, speaking for this Court in *Diamond v. Consolidated*, 220 U. S. 428, 441, "It gives the tribute of its praise to the prior art; it gives the Grant tire" (i.e. the patented device) "the tribute of its imitation." Important inventions do not spring full-fledged from the brow of an art; they are always preceded by prior efforts and failures, some of whom succeed in getting patents. Often it is wiser

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* The Court of Appeals said (R. p. 2387):

"There was much research and experimentation by those most highly skilled, including the engineers of the Aluminum Company. Colonel Vincent of the Packard Motor Car Company, one of the designers of the Liberty engine, and the engineering staff of the Franklin Automobile Company, under the direction of the defendants' expert Stellman, its chief engineer."

to purchase than to fight such patents, and having been purchased, the licensees feel more secure if their licenses include them for the same reason.

In any event, this record shows neither Spillman & Mooers nor Franquist was a success as an aluminum piston; quite the contrary. (R. pp. 177, 203, 204, 247, 249, 250, 254, 458, 462, 496, 528, 536, 540, 934-944, 1044, 1052, 1074, 1077, 1079, 1080.) Therefore, even if respondent had been mistaken and represented either to be so, no estoppel exists which closes respondent's mouth to speak the truth now and petitioners cite none.

Nor is there any correctness in the statement that the success of the aluminum pistons made under the patents in suit was ascribable to "the advent of the permanent molding of aluminum pistons in 1915." Efforts to use pistons involving the permanent molding inventions in pleasure automobiles failed from 1915 to the advent of the Maynard piston about 1922 (R. pp. 183-184) for the reason that such pistons slapped when cold (R. pp. 125, 400, 460) and stuck when hot. (R. pp. 73, 74, 478, 479.) These failures were affirmed by petitioners' expert. (R. pp. 546-548; see also R. pp. 256, 257, 458, 459, 460, 462, 466, 467, 471, 528, 539, 540, 544, 546, 547, 548, 554, 555, 563, 567, 588, 589, 994, 1077, 1079, 1080, 1761, 1763, 1828, 2235, and 66 Fed. (2) 964.)

We were asked to make suggestions on the Master's report only to questions in keeping with the Master's views. Inasmuch as all suggestions we had to make were contrary to his views (R. p. 1274)—as are the holdings of the Court of Appeals—we made none, and we see no reason why we should have been expected to do what he asked us not to do, for even if it is usual for a tribunal to consider a petition for a rehearing, lawyers do not like to present such a petition when specifically asked not to do so. Thus the usual opportunity to point out errors of a tribunal were denied petitioners by the Master.

Counsel say (Petitioners' Brief, p. 42) "that all Maynard did was to put the T-slot of Long on the piston of Schmiedeknecht." If that statement were correct, and such were the limits of Mr. Maynard's achievements, he would have produced a new combination of elements operating in a different way and achieving new results and such is the evidence supplied by petitioners' expert. (R. p. 563.) *

But Maynard did much more. He located the slots in the right place and he omitted the features of Long such as the U-slot (R. p. 1728), the six-sectioned skirt (R. p. 1736), and the half webs. (R. p. 1732.) Maynard caused the piston to expand and contract to conform to the engine cylinder during the life of the internal combustion engine which neither Schmiedeknecht nor Long ever did. (See Petitioners' expert, R. p. 458.) The evidence is that four or five-thousandths clearance is too much for success; two-thousandths is the limit. (Petitioners' expert, R. p. 460.)

Pursuant to the practice of relying for their contentions on the Master's finding, because the evidence is contrary to both finding and contention, we find the petitioners quote the Master's finding 51 at page 44 of petitioners' brief as follows:

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* Such a change in the prior art will not be tolerated (*Topliff v. Topliff*, 145 U. S. 156.)

Such a combination is patentable (*Expanded Metals v. Bradford*, 214 U. S. 366). The Court of Appeals said (92 Fed. (2) 334):

> "But to combine insulation of head from skirt, retraction of the bosses from the skirt periphery, connection of such bosses to the skirt with webs laterally flexible and yet so carried from the head as to support the load upon the wrist pin with sufficient strength and rigidity, and to utilize the mechanical force of the cylinder wall upon the skirt and the thermal expansion of the bosses so as to compensate evenly and fully for head expansion and to secure a balanced flexibility of the skirt with no bending concentration at any point therein, discloses, we think, a meritorious concept beyond the reach of those skilled in the art."

"(51) 'That defendants' pistons, Ex. 1, employs the essential structure, function and mode of operation of the prior art, more particularly the Franquist patent, No. 1,153,902.'"

Even defendant's expert testified contrary to this statement as follows (Exhibit 21 is the same except for immaterial details with Exhibit 1 and Exhibit 3-Q was a piston produced by petitioners as a Franquist piston) (R. pp. 552 and 553):

"Q. The ribs in the heads, you mean? A. These ribs here. There is no slot in the skirt—oh, yes, there is a slot shown on one side. In other words, it is a piston somewhat similar to Exhibit 1; is that right?

"Q. Yes, my understanding of it. Now that you have seen the slot in there, do you still say it would be too stiff? A. I would say it would be a pretty stiff piston at that.

"Q. Do you think that would be as stiff as this Exhibit 3-Q? A. Well, Exhibit 3-Q is a different design. It might not be stiff in the same places.

"Q. In what way is it different; in what way is 3-Q different from the one shown in 21? A. Well, these slots, these four slots in the surface, that has one. This has the wrist pin bosses supported by the skirt, and this has them supported by the webs. And the skirt is made with a small relief on this, and made with a large relief on that. The two pistons are not similar in design.

"Q. Well, do you say—I asked you about the stiffness—do you say they have a different kind of stiffness? Why do you say they would have a different kind of stiffness—because of the differences in design that you point out? A. Yes.

"Q. Do you find any other differences in them than those you have mentioned; I mean in design, structure? A. Oh, the only thing common is that the thrust surfaces of the piston are separated from the head."

Although unimportant to any issue here, it was incorrect to say as petitioners do (see petitioners' brief, p. 3)

that the Bohn Corporation agreed to "pool all patents relating to pistons *per se*." The Bohn Corporation never has assigned to respondent any interest in any patent issued to them on their own developments of which there are many.

"The Gulick flexibility is gained," says the witness quoted by petitioners at page 22 of their brief, "by flexible webs and flexible skirt and cooperation between horizontal and vertical slots." (R. p. 203.)

The proofs show that the piston Exhibit AAA comes within the patents in suit. (R. p. 86.)

The diagram at page 10 of petitioners' brief is misleading; if correct, it would present merely the overlapping grants on early and improvement inventions. It shows that Spillman & Mooers patent expired in 1931 and Franquist in 1932, showing that if what petitioners or the Sterling Company really wanted was to make aluminum pistons and not duplicate the respondent's licensees' commercial designs as fast as they came upon the market, which they have done in the past, these people could go back to Franquist or Spillman & Mooers, which they represent as excellent pistons.

ADAMSON v. GILLILAND AS AN ABSTRACT RULE.

The expression by Mr. Justice Holmes in this opinion to the effect that (under certain circumstances) the Master's report should be "treated as unassailable" has led to some confusion in the lower courts. We take it to be generally understood that, for the very purpose of putting an end to such confusion, this Court adopted general equity rule 61½, which rule is repeated and confirmed in the new Federal rules of 1938 by rule 52. Since the adoption of that rule (61½) there is obviously no force in contending that the Master's report or the finding of the trial judge has any effect excepting as that effect is carefully stated and limited in that rule. The Circuit Court of

Appeals for the Sixth Circuit has always adhered to that view of the Master's report which this Court, by the adoption of rule 61½, made obligatory upon all the lower courts.

The history of the "unassailable" doctrine justifies attention. It had its first formulation in *Davis v. Swartz*, 155 U. S. 631-636. The formula, as it was there stated and applied, was perfectly accurate. The court, on pages 636-7, points out that the Master, whose finding was under review, had been appointed not as the ordinary Master, but in effect as an arbitrator. This conclusion was reached by review of *Kimberly v. Arms*, 129 U. S. 512, where it had been determined that the circumstances of his appointment made the Master an arbitrator, and by concluding that the Master's appointment in *Davis v. Swartz* was of the same character. Having reached this conclusion, the court of course said that the Master's finding was as unassailable as is that of the verdict of a jury, or that of a finding of a federal trial judge without a jury. In other words, the rule applicable to reviews at law was applied in this case, because the court did not have the normal powers of an equity appellate court.

The next case is *Adamson v. Gilliland*, 242 U. S. 350. This opinion was by Mr. Justice Holmes. The question was as to the validity of a patent and, upon a sharp issue of fact, as to whether the patentee was the prior inventor. The trial court, upon conflicting testimony, had found that he was. The court quoted from *Davis v. Swartz* this "unassailable" formula. It did so after pointing out that the anticipator must prove his case beyond a reasonable doubt, and that the trial court, acting under this rule of law, had decided the issue against the anticipator. The formula was perfectly and properly applicable, because, if the finding of the trial court against the anticipator is supported by substantial testimony, it obviously cannot be true that

the anticipation has been proved beyond a reasonable doubt.

It is plainly quite another thing, and not supported by *Adamson v. Gilliland*, to apply this same formula to a finding by a trial judge that the anticipation has been established. Such a finding is entitled to great respect, but if, upon the evidence, it is clearly wrong, it cannot be "unassailable." So to consider it would be to deprive the Court of Appeals of the power to consider and apply the rule that such a defense must be proved beyond a reasonable doubt.

These two cases are believed to be the only ones where the Supreme Court has stated and applied this rule,* and neither one of them supports the theory that the appellate equity federal court is under any obligation to accept the fact finding of the trial court when that finding is against the clear weight of the evidence, or is not supported by the burden of proof which the law requires, or is for any other reason a clear mistake.

It would indeed be a sad commentary on federal jurisprudence if, in this case, the so-called fact conclusions of a Master, dependent on all conceivable questions of patent law and overruling a dozen decisions of the Patent Office and District of Columbia courts, and then adopted *in toto* by the District Judge, who heard no oral argument and rendered no explanatory opinion, thereby became a bar to any intelligent and careful consideration by the Sixth Circuit Court of Appeals.

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* In *Corona v. Dovan*, 279 U. S. 358, 375, the court referred to this rule as "claimed," but neither discussed nor applied it; and in *Alabama Co. v. Ickes*, 302 U. S. 464, 477, it was said that findings by the District Court which had passed unquestioned by the Circuit Court of Appeals, would then be so accepted by this Court.

PETITIONERS' POINT IV.

The Court of Appeals was justified in concluding that the presumption of validity of the Gulick patent in suit was strengthened by the interference contests in the Patent Office under this Court's decision in Radio v. Radio and Hildreth v. Mastoras, and that both presumption and support were further supported by many prior efforts and failures, some of which were testified to by petitioners' expert and by general adoption after tests by automobile engineers, etc. There is no error in overruling the Master and the District Judge on these questions because there was not a scintilla of evidence to support the conclusions of the Master and the District Judge where the Court of Appeals overruled the Master and the District Judge on fact questions.

As the Court of Appeals said, any presumption that normally arises to favor the finding of a District Judge "may prove to be an unsafe guide to just decision where exceptions to a Master's report are unilluminated by oral arguments and a decree entered without elucidation of the reasons upon which it is based" (R. p. 2389.) This refers to the scant attention the District Judge was able to give the cause due to the press of other matters, which was also the cause of the reference and respondent's application therefor, the alternative of which was no trial at all in view of such press of work.

This lack of illumination and attention is at once manifest when we note that the Court of Appeals relied upon this Court's opinion in *Radio v. Radio*, 293 U. S. 1, and the District Judge was unable to note that there were in the instant cause the same lengthy and contested interference proceedings and appeals that were present in the cited case and which this Court ruled, in the cited case, greatly

strengthened the presumption of validity.* The careful scrutiny of the Court of Appeals is a safer guide to a just decision than haste and oversight due to overwork that misses matters so important to a just decision.

We will not here repeat the evidence found by the Court of Appeals to sustain the presumption of validity strengthened as it is under the rule of this Court in *Radio v. Radio*; the Court of Appeals ably discusses and applies it. (R. pp. 2387 and 2388.) The facts upon which it is based are undisputed; the salient facts are affirmed by petitioners' expert. (R. pp. 216, 256, 257, 359, 363, 364, 398, 399, 401, 429, 444, 455, 458, 461, 462, 464, 469, 528, 546, 547, 548, 553, 554, 567, 642, 937, 938, 986, 1010, 1011, 1089, 1438, 1587, 1728, 1732, 1753, 1761, 1828 and 2235.)

Alleged Broadening of the Gulick Application After Intervening Rights Arise:

This contention does not, of course, apply to Maynard.

It cannot apply to Gulick either because his patent claim 1, one of the broadest of Gulick's claims, was included in the application as filed and has remained in the application without change ever since. (R. pp. 1840, 1565, 1570.) The Court of Appeals found that this claim was infringed by Petitioners' Exhibit 1 piston. (R. p. 2395.)

The "intervening rights" were not such as accrue to any of the petitioners here and are not claimed to so accrue. There is, therefore, no estoppel in favor of any of these petitioners to assert that a claim broader than claim 1 was

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* See R. p. 2385:

"There followed long discussions with the examiners, administrative reviews, bitterly contested interferences, and appeals to the Court of Appeals of the District of Columbia (*Long v. Gulick*, 57 App. D. C. 98, 17 F. (2d) 686), and to the Court of Customs and Patent Appeals (*Hartog v. Long*, 47 F. (2d) 369)."

inserted after said intervening rights if such a broader claim than claim 1 had been inserted.

All the alleged intervening activities, called "intervening rights" by petitioners, were the work of the respondent's licensees, including even the pistons of Long which were made of castings licensed under the patents in suit. (R. p. 940.) There is no evidence in this record that Long made, sold, or used, within the period complained of, any commercial pistons other than those which were licensed under the patent rights in suit here.

We know of no rule which permits an infringer to take advantage of a patentee because of alleged "intervening rights" which consisted of the activities of that patentee or his licensees. Counsel cite, and can cite, none. The same applies to a claim that a patentee may not broaden the subject matter claimed because he or his licensee may have been commercially active in the meantime.

We recognize the rule that a reissuer of a patent may not broaden his claims against one who has acquired "adverse intervening rights" himself, but that rule is not applicable here because (1) the principle upon which it is based is not here present, (2) there was no broadening of subject matter claimed and (3) the alleged intervening rights were not by any petitioner but were licensed under the patents in suit.

The fallacy of petitioners' position is reflected in the last sentence of its section Point IV (see petitioners' brief, p. 52):

> "The question was not whether invalidity was shown 'by clear and cogent evidence,' but whether, as a matter of law, a patent is valid which does not disclose, describe or discuss in its specification *an element* found to be essential."

This would be forcible if "an element" had been omitted from the original disclosure, but the element, i.e.

the web, is not omitted; it was originally included in each the drawing, the specification and in claims of each of the patents in suit. It is a description of an inherent property of the material of the web, i.e. flexibility, that was omitted. This statement shows, as we have contended throughout this brief, that petitioners' claim that the disclosure omitted an element—which is fatal to a patent claim under the law * —is in effect a claim that there is omitted only the mention of a property inherent in the material of the element and known to be so by every novice in the industry and which the law does not require be included. Thus does the final sentence of petitioners' brief point the error of petitioners' contention.

The Plates in the Back of Petitioners' Brief: The cuts illustrated opposite page 61 are an invitation to make comparisons by the eye without the understanding. Nothing could be more misleading where similarities and dissimilarities are bottomed, as here, primarily, upon an understanding of operations and results. The cut illustrating the Franquist piston does not show the rigid gutters under the slots which alone destroyed any possibility of this piston being a solution of the problem. (R. pp. 177, 246, 249, 496, 537, 540, 558, 943, 944, 1078.)

The legend "Long 1917-1926" above the cut in the center of the page is incorrect and misleading. The production by Long of such a piston as there shown prior to the filing date of either Gulick or Maynard is not established in this record. The evidence shows that Long made many efforts to solve the piston problem (R. p. 429), but was, as late as 1919, still short of the piston shown. (R. p. 1736.)

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* The fatal effect would apply only to the claims which included the omitted element since the disclosure without a recitation of the element would support claims not reciting it (*Boyce v. Stewart-Warner*, 220 Fed. 118, 123, C. C. A. 2).

The first drawing of the Long piston here illustrated is dated February 20, 1923. (R. p. 1592.) The oral evidence as to the date of the first use of this Long piston is clearly insufficient under the rule in the *Barbed Wire Case*, especially where, as in the instant case, the witnesses were so carefully "horseshedded" in advance by opposing counsel.*

The cuts showing the Schmiedeknecht piston do not show (as is true) that it is rigid in all of its parts, or (as is true) that the structure would fall apart if slit and split in the manner proposed by Gulick. Petitioners in the Court below contended that Schmiedeknecht did not embody what is shown in Exhibit 1 (and *ipso facto*, by what is shown in the Maynard piston, since, as can be seen from the cuts, one is a duplicate of the other).

As we have said, in this brief we cannot go into the testimony pointing out the differences between these prior art pistons and the patented and defendant's pistons, on the one hand, and the similarity between the patented pistons and the defendant's piston, on the other hand. Neither question is presented in the Points of the Petition for Certiorari or of the petitioners' brief. Within the limits of this brief we can only point out the danger of being deceived by what the eye sees alone, and the necessity of feeding the understanding as well as the eye before a just decision on these similarities and dissimilarities can be

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* For example, see R. p. 358:

"Mr. Bruninga told me a couple of days ago that I would be called as a witness, and I had a discussion with him at that time, but not about what I was going to testify to. He asked me a lot of questions and I believe he wrote down the answers. I believe it was this morning that he mentioned that I might be interviewed by Mr. McCoy or by you, (Richey), or by somebody representing the other side. *He told me to tell you that I would be glad to answer any question for you, on the witness-stand, of one of you interviewed me.*"

See also R. pp. 408 and 320.

made. Such a course was followed by the Court of Appeals as Judge Simons' opinion clearly shows.

The cut at page 5 of petitioners' brief does not clearly show the vertical slot. A complete view of this piston is shown at page 1284 of the record.

The Patent Pool and the License to Aluminum Company of America: Although quite immaterial to any issue in this cause, and entirely aside from these "reasons relied upon," the petitioners discuss at length—both apart from and in connection with other subjects—"the patent pool" and, wherever counsel thinks there is an opportunity to do so, they drag in the name of the Aluminum Company of America, one of the non-exclusive licensees under the patents in suit. This discussion can have no other purpose than to seek to unbalance the scales of justice by appeals to ancillary questions.

First: Both questions were presented to the Master who ruled against the petitioners on each; petitioners took no exception. (See Finding of Fact No. 9 and Conclusions of Law, Nos. 1, 2, 3, 4, and 9 of the Master, R. pp. 1097, 1105 and 1106.) Under well established authority, there the matter does and should end.

Zellerbach v. Helvering, 293 U. S. 172, 182, 79 L. Ed. 264, 270.

Second: Neither the establishing of a patent pool—if, in fact, any such exists here—nor the granting of a license to Aluminum Company of America under the patents in suit constitutes a defense in a patent infringement suit. (*Walker on Patents*, Sixth Edition, pp. 16 and 17; *Oil Cracking Case*, 283 U. S. 163; *Kardo v. Adams*, 231 Fed. 950; *Trico v. E. A. Laboratories*, 49 Fed. (2) 404, 405; *Andrea, Inc. v. Radio*, 14 Fed. Sup. 226.)

Third: Since infringers of patents are permitted to pool their interests* and combine against the patentee and the inventor, and since others, such as workmen, farmers, etc. are permitted to pool their interests, there seems no reason why the same privilege should be denied those who in the language of the wise are the greater benefactors of all.** (Of course, lacking any price control or extra-patent

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* For example, the cases defended by The National Automobile Chamber of Commerce (*Reo v. Gear Grinding*, 42 Fed. (2) 965 and the *Spot Weld Case*, 265 U. S. 445; *Swan v. Reeke-Nash*, 88 Fed. (2) 885).

** Francis Bacon gave the weight of his opinion to view somewhat similar to the above. He says:

"The introduction of great inventions appears one of the most distinguished of human actions, and the ancients so considered it; for they assigned divine honors to the authors of inventions, but only heroic honors to those who displayed civil merit; such as the founders of cities and empires, legislators, the deliverers of their country from last misfortunes, the quellers of tyrants, and the like. And if any one rightly compare them, he will find the judgment of antiquity to be correct; for the benefits derived from inventions may extend to mankind in general, but civil benefits to particular lands alone; the latter, moreover, last but for a time, the former forever. Civil reformation seldom is carried on without violence and confusion, while inventions are a blessing and a benefit without injuring or afflicting any.

* * * * *

"Now among all the benefits that could be conferred upon mankind, I discovered none so great as the discovery of new arts for the bettering of human life. For I saw that among the rude people of early times, inventors and discoverers were reckoned as gods. It was seen that the works of founders of States, law-givers, tyrant-destroyers, and heroes cover but narrow spaces, and endure but for a time while the work of the inventor, though of less pomp, is felt everywhere, and lasts forever."

On this subject Lincoln, on February 22, 1860, said:

"Next came the patent laws. These began in England in 1624, and in this country with the adoption of our Constitution. Before then any man (might) instantly use what another

(Continued on page 70)

monopoly.) As inventions have become more abstruse, the difficulties and the expenses of presenting patent causes, ripe for adjudication, have increased until, in many instances, such as the present, they have exceeded the purses and the abilities of individual inventors. Hence, as with the other classes we have named, inventors and, as must inevitably happen, other types of patentees, have united in protecting their patents. What petitioners call the "piston patent pool" was initiated and advanced by an individual inventor named Mooers (patentee of one of the patents in this suit) seven years before the Aluminum Company took a license thereunder. Other inventors are involved as individuals, and since patents had been granted to Aluminum Company of America, and to others, which patents were important, if not essential, to protect the interest of Mr. Mooers and these individual inventors, these patentees were admitted to the group also. If the Aluminum Company is the co-beneficiary with the individual inventor Mooers, it is because the government has granted piston patents to the Aluminum Company. The bread that Mr. Mooers has earned by the sweat of his brow should not be destroyed because the government has made him a bedfellow with one of whom the petitioners disapproved.* The eighty patents included in the group are a small part of the existing piston patents, are few compared with the number of patents owned by many big corporations, and include many

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*It would seem that judgment, even of the petitioners, about the Aluminum Company might abide the trial of the cause of the United States against that company, now pending before Judge Caffey in the Southern District of New York.

(Continued from page 69)

man had invented, so that the inventor had no special advantage from his invention. The patent system changed this, secured to the inventor for a limited time exclusive use of his invention, and thereby added the fuel of interest to the fire of genius in the discovery and production of new and useful things."

patents which are unimportant, but through the purchase of which many individual inventors have recovered their investments.

Thus not only has invention been encouraged through the grouping of these patents by providing individual inventors with a possible means of realizing on their inventions through cooperative action, but also by the purchase of patents from individual inventors at prices which have assured them a profit on their investments which could not have been realized by them otherwise. The scheme is but another one of those changes evolved in a system to meet changed conditions. The scheme benefits the inventor; it benefits the public, it is the infringer alone who is inconvenienced, and it is the infringer alone who has complained. We note that it is a matter of common knowledge in this industry, as well as with the well informed general public, that the Department of Justice of the United States made a thorough and careful investigation of the plaintiff's "piston patent pool"; and took no action.

Petitioner's general attacks warrant, if they do not demand, a general answer. History has so well established the advantages to the public of the American patent system that those advantages cannot now be denied, as Lincoln said (see quotation *supra*). Few inventions were made prior to its institution and those few were widely scattered over time. The administrations of all patent systems prior to the year 1800 were ineffective; as administered they were a fraud on, rather than an aid to, inventors. The people of the United States were so indignant over the successful manner in which the cotton planters deprived Eli Whitney of his invention of the cotton gin and his rights to rewards therefor that there arose in the United States in the early part of the last century, a popular clamor for the better administration of the patent laws. It resulted that the Courts in this country soon thereafter developed and adopted a

system of providing real protection to inventors. There followed such a host of important inventions as to initiate a period of progress and prosperity such as the world had never before known in any country or at any time. This has continued until people have forgotten the hardships of the preceding eras. It is the loss of the inventor that people so soon forget the hardships he has eliminated.

There is just off the press a book entitled "March of the Iron Men" by Roger Burlingame, which summarizes these facts and proves the statements made by Bacon, Lincoln, and others, which we have quoted *supra*. We know now that inventions made during certain political eras of this country, as Mr. Burlingame points out in particular and Sir Francis Bacon pointed out in general, were more important than any political or social event that happened during those periods. The invention of reaping machinery during the time of Andrew Jackson, for example, was more important than any other event that happened during that period. The invention of Howe's sewing machine in 1846 was more important than any political happening during Polk's administration. Other comparisons are made by or are apparent from the data given by Mr. Burlingame. (See pp. 468-476 of his book.)

It is equally true that there were in political life both the liberals and progressives prior to this era, just as there are liberals and progressives in the non-machine countries today. Progress and liberalism, however, have depended upon the production by machines of the wealth to be distributed, and upon the production of those machines by inventors. No one had more liberal and more progressive intentions and designs than Lenin and his associates. Their efforts both at liberalism and progressiveness failed because there was no machine-produced wealth to distribute and no inventors to invent machines. They sought to save themselves from these failures by introducing the machines

invented in other countries, but their efforts came too late to save either their intended liberalism or progress.

If, therefore, it be necessary to a continuation of the encouragement of inventors that in a changing world, they be permitted to pool their patents, that course, even though it resulted in some minor disadvantages to the public, is justified if it preserves or encourages the greater advantages and benefits to the public of continuing the productions of inventions which have initiated and continued the great era of progress and prosperity to which we have referred. Nor is this great cause to be slowed or stalled because it is helped and advanced by one of whom the petitioners disapprove. Assuming that a practice of pooling patents involves minor evils along with major benefits, such is true of any new law or procedure. It is true of any reform. It is true of any progress. As Sir Francis Bacon said "civil reform seldom is carried on without violence and confusion." Whatever, if any, disturbance may have been caused by the pooling of patents, no violence or confusion has been caused thereby.

Patent pools are by no means new. The first recorded patent pool in this country was formed in the middle 1850's around the Howe sewing machine invention. No one can doubt the lasting benefit conferred upon women in all countries and in all times by the invention of the sewing machine. Yet Howe, the inventor, reaped nothing but disaster until he and his backer pooled his patent with those of others, including the Singer Sewing Machine Company, which was anathema in those days. There is no reason why Mr. Mooers should not have benefited by Howe's experiences and formed this "piston patent pool" without experiencing the hardships of Howe before its formation. Howe's patent pool was formed and conducted to best promote the sale and use of the sewing machine. Every patent pool since that time has been formed and conducted for sim-

ilar purpose. In the instant cause, successful adoption and use of aluminum pistons is bottomed upon careful manufacture and scientific machining of those pistons. Departure from either of these precepts spells disaster not only to the user of a poorly made or machined piston, but calamity to the reputation of the aluminum piston and a cessation of its further use. The public—even the automobile repairing public—is unable to tell the difference between a good aluminum piston and a bad aluminum piston, so much do the alloys, from which, and the designs on which, good and bad aluminum pistons are made resemble each other. It was and is, therefore, not only to the interests of the public who use aluminum pistons, but essential to the success of the aluminum piston, that its manufacture should be confined to those skilled in the making of aluminum piston alloys, the casting of the crude pistons, and the scientific machining of the same to the intended designs with the almost inconceivably small clearance essential to success. To have extended the rights to manufacture aluminum pistons under the patents in suit, indiscriminately, would have resulted in innumerable wrecked automobile engines and in a destruction of the reputation of the aluminum piston and an end to the use of these pistons and the realization of the benefits that accrued to the public from their use. It was for this reason that licenses under the patents were limited to the present licensees, who are enough to furnish adequate competition from a sufficient number of sources of supply.

The situation is not without analogy to practicing medicine and filling druggists' prescriptions. No doubt licenses issued, helter-skelter, to practice medicine and fill prescriptions would cheapen both medical services and medicines, but a lot of people would be poisoned. A poisoned engine is also a disaster. Therefore, aside from any legal rights which respondent may have to control its patent rights as it thinks wisest (see *U. S. v. General Electric*, 272 U. S.

476), public convenience and public policy justified limiting the licenses issued.

Counsel have referred frequently to the Aluminum Company of America as if it were taken for granted that the mere name of that company is justification for striking down the patent rights of the inventors and other patentees whose interests are intrusted to the plaintiff. There is no justification for assuming that patent rights should be destroyed or restricted because the Aluminum Company of America is a licensee under those patents. Nor is it material to any issue in this cause that the Aluminum Company of America failed on a group of patents different from those here involved, in a suit foreign to this suit, brought by the Aluminum Company of America against the manufacturer of the pistons held to infringe in the instant cause.

We have dealt with these matters at this length because we have felt that this underbrush ought not to confuse the real issues presented by the petition, and because so often the broader principles involved are forgotten in a more technical discussion of narrower issues.

Conclusion: The error of petitioners' position is reflected in the last sentence of its section Point IV (see petitioners' brief, p. 52):

> "The question was not whether invalidity was shown 'by clear and cogent evidence,' but whether, as a matter of law, a patent is valid which does not disclose, describe or discuss in its specification *an element* found to be essential."

This would be forcible if "an element" had been omitted from the original disclosure, but the element, i.e. the web, is not omitted; it was originally included in each the drawing, the specification, and in claims of each of the patents in suit. It is a description of an inherent property of the material of the web, i.e. flexibility, that was omitted.

This statement shows, as we have contended throughout this brief, that petitioners' claim that the disclosure omitted an element—which might be fatal to a patent claim under the law—is in effect a claim that there is omitted only the mention of a potency inherent in the material of the element and known to be so by everyone in the industry and which the law does not require be included.* (*Radio vs. Radio*, 293 U. S. 1, 14.) *Thus does the final sentence of petitioners' brief point the error of petitioners' contention.*

Much in generalities ought to be said in conclusion, but we will limit ourselves to the observation that in equity and good conscience the rights of those, whom such master thinkers as Sir Francis Bacon and Abraham Lincoln have proclaimed as the greatest of human benefactors, should not be stricken down on such hair-splitting technicalities as are here urged. No one in his senses doubts for a moment that the patents do, in fact, and have, in fact, furnished more evidence to the builders of pistons than is furnished such builders by the engineer who designed the piston built by those builders. No one in his senses questions the sufficiency of the disclosures to teach those skilled in the art how to build the pistons. The maker of the infringing pistons had no difficulty in duplicating the plaintiff's licensees' pistons after that maker failed to succeed with pistons of its own design. (R. p. 1074.)

Everyone knows that in this imperfect world imperfection of a dialectic nature can be found in every document, legal or otherwise classified, but nobody can cite any instance where any Court of Equity in this or any other land struck down a patent or any other contract because of

---

* The fatal effect would apply only to the claims which included the omitted element since the disclosure without a recitation of the element would support claims not reciting it (*Boyce v. Stewart-Warner*, 220 Fed. 118, 123, C. C. A. 2).

a failure to do the impossible, i.e. describe all the known properties inherent in all the elements.

We think the Court of Appeals should be affirmed.

If this Court should, nevertheless, reverse the Court of Appeals, we think the cause should be remanded to the Court of Appeals with directions to that Court to rule upon the claims of the Gulick and Maynard patents * and the other patents in question which are involved in the cause and in the appeal and presented to the Court of Appeals, but which the Court of Appeals did not rule upon because of the presumption by the Court of Appeals that its decision would stand as a final disposition of the cause and would be unchanged, and if it did stand as a final disposition of the cause and was unchanged, there would be no need—or so that Court thought—of ruling upon these other matters and questions. If this Court should reverse the Court of Appeals on the questions that the Court of Appeals did decide, then the decision of the Court of Appeals on the questions not ruled upon by that Court would become important. In other words, the Court considered that full recovery could be had by the plaintiff under the claims of the Gulick and Maynard patents selected by that Court from those relied upon and, without disposing of the other questions, ordered the cause dismissed without prejudice with respect to these other questions. If this Court should reverse the Court of Appeals on the claims of Gulick and Maynard thus selected and ruled upon so that no recovery can be had upon them, it is obvious that these other questions become important and should be considered and disposed of by the Court of Appeals in lieu of those which that Court selected and ruled upon as sufficient in the light of the Court's pre-

* Some of these claims did not recite the webs and, therefore, would not be involved even if petitioners were right on all four of their points.

sumption that its ruling would be final. (*Crown Cork & Seal Co. v. Ferdinand Gutmann*, 82 L. Ed. 835, Advance Opinions; *Cramp v. International*, 228 U. S. 645, 57 L. Ed. 757.)

Respectfully submitted,

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Attorneys for Respondents.

FILE COPY

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SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1937.

No. [redacted] 3

THE SCHRIBER-SCHROTH COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. [redacted] 4

THE ABERDEEN MOTOR SUPPLY COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. [redacted] 5

THE F. E. ROWE SALES COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

PETITION FOR REHEARING

Of a Petition for Writs of Certiorari to the Circuit Court of Appeals for the Sixth Circuit.

THOMAS G. HAIGHT,
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JOHN H. SUTHERLAND,
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SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1937.

No. 674.

THE SCHRIBER-SCHROTH COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. 675.

THE ABERDEEN MOTOR SUPPLY COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. 676.

THE F. E. ROWE SALES COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

PETITION FOR REHEARING

Of a Petition for Writs of Certiorari to the Circuit Court of Appeals for the Sixth Circuit.

To the Honorable The Chief Justice of the United States, and the Associate Justices of the Supreme Court of the United States:

Respondent brought suit against Petitioners, alleging infringement of five patents relating to pistons for internal combustion engines. The District Court held all the patents invalid and further held that the accused device (Ex-

hibit 1) employed "the essential structure, function and mode of operation of the prior art" (Rec. p. 1105), confirming the report of a Special Master before whom the case had been tried. The Court of Appeals for the Sixth Circuit held two* of the five patents to be valid, and to have been infringed by the Exhibit 1 piston, reversing the decree of the District Court as to those two patents, and ordering that the Bill be dismissed **without prejudice** as to the remaining three patents.

On February 14 last, this Court denied Petition for Writs of Certiorari.

There is no conflict of decisions, as between different Circuits, on the question of validity of these patents. However, due to the peculiar situation of the automotive industry, there is only the remotest possibility that any other Circuit Court of Appeals will ever be afforded an opportunity to pass upon the validity of these patents.

Since the denial of the Writs in these cases there has been published in the "Automotive Industry" of February 26, 1938, certain data with reference to the manufacture of automobiles which unmistakably shows that, through the decision of the Circuit Court of Appeals for the Sixth Circuit in these cases, Respondent has established the validity of its patents against 94.67% of the automotive industry. These circumstances, it is thought, should take the case outside the general rule requiring a conflict of decisions as a prerequisite to the grant of a Writ of Certiorari in patent cases, and we respectfully suggest that in view of the existence of such a situation this Court, in the interest of justice, should not refuse to review these cases at this time, unless it is satisfied of the soundness of the decision of the Circuit Court of Appeals

*Gulick 1,815,733.
Maynard 1,655,968.

on the question of validity of the Gulick and Maynard patents.

I.

In "Automotive Industry," a recognized trade paper, there was published, on February 26, 1938, data showing the sales of automobiles by the various manufacturers in the period 1929 to 1937. From the published data the following condensed summary may be made:

Manufacturers Within the Sixth Circuit.		Manufacturers Without the Sixth Circuit.	
General Motors	8,787,556	Auburn	94,783
Chrysler	4,170,813	Austin	12,045
Ford	6,399,757	De Vaux	6,166
Continental	4,263	Durant	77,519
Graham	192,077	Franklin	25,585
Hudson	810,155	Marmon	41,830
Hupmobile	119,563	Nash	399,535
Packard	317,563	Studebaker	482,941
Reo	54,018	Miscl.	58,542
Willys	439,026		
Total	21,294,814	Total	1,198,946

Of the manufacturers without the Sixth Circuit but two, Studebaker and Nash, remain in the business today. During the month of February, 1938, Studebaker and Nash together produced but 2.61 per cent* of the automobiles manufactured in this country. As a practical matter, through the expedient of suing their dealers or otherwise,

*"Automotive Daily News," Detroit, Michigan, March 3, 1938, Vol 13, No. 2489. This publication as well as the "Automotive Industry" of February 26, 1938, are called to the attention of the Court in accordance with precedent (Brinkerhoff-Faris Co. v. Hill, 280 U. S. 550, 281 U. S. 673; Olmstead v. United States, 276 U. S. 609, 277 U. S. 438; St. Louis Union Trust Co. v. Mellon, 231 U. S. 648, 241 U. S. 657, 242 U. S. 666; Helvering v. Northern Coal Co., 290 U. S. 59; Sanitary Co. v. Winters, 278 U. S. 587, 280 U. S. 30, 34; Paramount Publix Corp. v. American Triergon Corp., 294 U. S. 464).

even these two nonresident automobile manufacturers may, in effect, be subjected to the jurisdiction of the Sixth Circuit Court of Appeals, as indeed they have been in the past (Reeke-Nash Motors Co. v. Swan Carburetor Co., 88 Fed. [2d] 876; Gear Grinding Company v. Studebaker Company, 270 Fed. 93).

II.

Having such complete jurisdiction of the automobile manufacturers, the decision of the Sixth Circuit Court of Appeals will be the last word upon the validity of the Gulick and Maynard patents, unless this Court intercedes. The automobile manufacturers use and sell the pistons and hence are chargeable with infringement, notwithstanding that the piston may have been fabricated without the Sixth Circuit.

It is not reasonable to expect that Respondent will go outside of the Sixth Circuit to sue a piston manufacturer when it can cut off the piston manufacturer's outlet by bringing suit against the automobile manufacturers within the Sixth Circuit, where the patents have been sustained as valid. Respondent declined an invitation (Rec. p. 22) to bring suit against the manufacturer (an inhabitant of the Eighth Circuit) of the piston accused in these cases.

Respondent has maneuvered so as to be in a position such that if it won in the Sixth Circuit, it would have practically all the relief it was entitled to, and could rely upon this Court's rule, with reference to the necessity of conflict of decisions, to avoid a review of the validity of its patents by this Court, but, in the event that it lost in the Sixth Circuit, it could still sue elsewhere. Respondent thus had "two bites at a legal cherry," but the piston manufacturers and the automobile manufacturers have no such alternative to fall back upon. The piston manufac-

turers and the automobile industry have no such opportunity, in a subsequent suit, to establish a conflict of decisions.

Under the circumstances shown, we submit, the general rule of this Court, that a conflict of decisions is prerequisite to a review of patent cases, works a hardship upon the manufacturing industry, but offers an advantage to Respondent.

In our Petition for Writs of Certiorari we contended, correctly, we think, that the decision of the Sixth Circuit Court of Appeals was in discord with various decisions of this Court. It is deemed unnecessary to repeat here, except to pray the Court to re-examine the points brought out by the Petition, and that, unless the Court is satisfied of the soundness of the decision below, to grant the Writs.

Wherefore, it is prayed that the Petition for Writs of Certiorari in the above-entitled causes be re-examined and reconsidered with the view that, if the Court deems the decision of the Circuit Court of Appeals on the issues of validity to be unsound in any respect, the Writs be granted.

Respectfully submitted,

THOMAS G. HAIGHT,
GEORGE L. WILKINSON,
JOHN H. BRUNINGA,
JOHN H. SUTHERLAND,
Attorneys for Petitioners.

March 7, 1938.

I hereby certify that the foregoing Petition for Rehearing is filed in good faith and not for the purpose of delay.

John H. Bruninga.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1937.

No. [redacted] 3

THE SCHRIBER-SCHROTH COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. [redacted] 4

THE ABERDEEN MOTOR SUPPLY COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. [redacted] 5

THE F. E. ROWE SALES COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

MOTION FOR LEAVE TO FILE SECOND PETITION FOR REHEARING

and

SECOND PETITION FOR REHEARING

Upon Petition for Writs of Certiorari to the United States Circuit Court of Appeals for the Sixth Circuit.

JOHN H. BRUNINGA,
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SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1937.

No. 674.

THE SCHRIBER-SCHROTH COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. 675.

THE ABERDEEN MOTOR SUPPLY COMPANY, Petitioner,

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No. 676.

THE F. E. ROWE SALES COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

MOTION FOR LEAVE TO FILE SECOND PETITION FOR REHEARING

Upon Petition for Writs of Certiorari to the United States Circuit Court of Appeals for the Sixth Circuit.

To the Honorable, The Chief Justice of the United States, and the Associate Justices of the Supreme Court of the United States:

Now come Petitioners in the above-entitled cases and move for leave to file their Second Petition for Rehearing (lodged herewith) upon their Petition for Writs of Certiorari to the Circuit Court of Appeals for the Sixth Circuit.

In support of this motion Petitioners show:

That, in their Petition for Writs of Certiorari, Petitioners charged that it was "doubtful that Respondent will permit another Circuit Court of Appeals to adjudicate the patents here in suit (Petition, p. 13) because of the fact that all of the important* aluminum piston business in this country is controlled by the Sixth Circuit decision, and that Respondent would prefer to forego any attempt to enforce its patents against lesser infringers elsewhere, rather than to risk adjudication thereof in another circuit.

To this Respondent answered (Br. p. 5) that there were other infringers in other circuits, and that "there has been no time to institute suit against" others in other circuits "and no need to do so until it can be determined whether such infringements will cease without suit." Again in opposition to our Petition for Rehearing Respondent said (Br. p. 3) that "they may withhold litigation until others have had a reasonable opportunity to conform to the rulings of the Court of Appeals for the Sixth Circuit."

That Petitioners challenge the sincerity of Respondent, in impliedly thus saying to this Court, that if the other manufacturers in other circuits did not conform to the ruling of the Court of Appeals for the Sixth Circuit, suits would be instituted in other circuits. More than seven months have now elapsed since the decision of the Sixth Circuit Court of Appeals. Although the opportunity exists in the Seventh, Eighth and Ninth Circuits (as shown by the annexed affidavit of Gregory Barac), Respondent has not yet instituted suit in any other circuit.

That Respondent has had ample "time to institute suits"

*95% of the nation's aluminum piston business—see annexed affidavit of Horace Duncan.

in other circuits, if it had any intention of so doing, and the manufacturers in other circuits have had ample "opportunity to conform to the ruling of the Court of Appeals for the Sixth Circuit" if they purpose to do so.

That the Respondent has confined, and in all probability will continue to confine, its litigation to the Sixth Circuit rather than to risk its patents in another circuit and thus Respondent is in position to forestall a conflict between decisions of different circuits and consequently to forestall an adjudication of its patents by this Court unless this Court intercedes in these cases.

That no member of the public can compel Respondent to adjudicate its patents in any other circuit, and there is no indication that Respondent will ever voluntarily afford any other Circuit Court of Appeals an opportunity to adjudicate Respondent's patents.

That the Petition for Writ of Certiorari and the Second Petition for Rehearing thereon are meritorious and present questions of great public importance as well as important questions of patent law which have not been settled by this Court.

Wherefore, it is prayed that leave be granted Petitioners to file their Second Petition for Rehearing (lodged herewith) upon their Petition for Writs of Certiorari.

THE SCHRIBER-SCHROTH COMPANY,
THE ABERDEEN MOTOR SUPPLY COMPANY,
THE F. E. ROWE SALES COMPANY,
Petitioners.

JOHN H. BRUNINGA,
JOHN H. SUTHERLAND,
Attorneys for Petitioners.

It is hereby certified that the foregoing Motion for Leave to file Second Petition for Rehearing is believed to be well founded in law and in fact, and that it is not interposed for the purpose of delay.

John H. Bruninga.

AFFIDAVIT OF HORACE DUNCAN.

State of Missouri,
City of St. Louis. } ss.

Horace Duncan, being duly sworn, deposes and says that he is secretary and treasurer of Sterling Aluminum Products, Inc. (formerly called Sterling Products Corporation); that he has been engaged in, and familiar with, the aluminum piston business since 1923; and that he is, and has been, in position to estimate the volume of aluminum piston business done by the competitors of Sterling Aluminum Products, Inc.

That, in the opinion of affiant, more than ninety-five per cent of the aluminum pistons manufactured in the United States are either manufactured by manufacturers located within the States of Ohio and Michigan, or manufactured by Sterling Aluminum Products, Inc., or assembled into automobiles by manufacturers located within the States of Ohio and Michigan.

Horace Duncan.

Sworn to and subscribed before me this 21st day of May, 1938.

My commission expires November 4, 1940.

Joseph V. McShane,
Notary Public.

(Seal)

AFFIDAVIT OF GREGORY BARAC.

State of Missouri, }
City of St. Louis. } ss.

Gregory Barac, being duly sworn, deposes and says that he is of lawful age, that he is assistant to the Manager of Replacement Sales of Sterling Aluminum Products, Inc., of St. Louis, Missouri, and that he is familiar with the type of aluminum pistons offered for sale to the replacement trade by the competitors of Sterling Aluminum Products, Inc.

Affiant further says that pistons of the character shown in the following cuts

have been, and are being offered for sale in the replacement trade by the competitors of Sterling Aluminum Products, Inc. That the piston shown in Figure 1, above, is being offered for sale and sold by the Elgin Machine

Works, Inc., of Elgin, Illinois, and that on May 17, 1938, affiant purchased the piston shown in Figure 1 from said Elgin Machine Works, Inc.

Affiant further says that on May 17, 1938, he purchased the piston shown in Figure 2, above, from Automotive Warehousing Company of St. Louis, Missouri, and was then and there informed that said piston was manufactured by the United Engine and Machine Company of San Leandro, California.

Gregory Barac.

Sworn to and subscribed before me this 21st day of May, 1938.

My commission expires November 4, 1940.

Joseph V. McShane,
Notary Public.

(Seal)

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1937.

No. 674.

THE SCHRIBER-SCHROTH COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. 675.

THE ABERDEEN MOTOR SUPPLY COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

No. 676.

THE F. E. ROWE SALES COMPANY, Petitioner,

vs.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Respondents.

SECOND PETITION FOR REHEARING

Upon Petition for Writs of Certiorari to the Circuit Court of Appeals for the Sixth Circuit.

To the Honorable, The Chief Justice of the United States, and the Associate Justices of the Supreme Court of the United States:

Petitioners recognise that, as a general rule, this Court should not be burdened with patent cases, save where

there is a conflict between decisions of different circuits. But in a case such as this where the decision of one Circuit controls virtually the entire industry throughout the United States, at least the ninety-five per cent* of it, the Court would be justified in relaxing the general rule as it did in Paramount Publix Corp. v. American Tri-Ergon Corp., 294 U. S. 464, and in Altoona Publix Theaters, Inc., v. American Tri-Ergon Corp., 294 U. S. 477, where a comparable situation as to nation-wide effect of the decision of one circuit prevailed.

Indeed, in the instant cases there would appear to be stronger reason for relaxing the rule than in the case of Altoona Publix Theaters, Inc., v. American Tri-Ergon, Corp., supra, where the lower courts had concurred in holding the patent valid. On the contrary, in the instant cases the Circuit Court of Appeals is the only one of three tribunals considering this litigation that has held the patents valid. The cases were tried on the merits before a Special Master who found the patents invalid (R. pp. 1106-9). Upon exceptions the District Court confirmed the Master's report holding the patents invalid (R. p. 1229). Then the Circuit Court of Appeals reversed, and held valid two of the five patents sued upon, dismissing without prejudice as to the other three patents (R. p. 2395).

As thus narrowed by the Court of Appeals the sole issue now involved in these cases is whether Respondent has a

*Affidavit of Horace Duncan annexed to Motion for Leave.

right to prevent Petitioners from making and selling an aluminum piston as shown:

Exhibit 1

where that piston is nothing in the world but the piston of the **Respondent's own** now-expired Schmiedeknecht patent (R. p. 1305)

Perspective view of Schmiedeknecht patent piston

slotted to embody the teaching of **Respondent's own** now-expired Franquist patent (R. p. 1687):

> "With this object in view, the invention consists of a piston having a sleeve which is circumferentially compressible and is adapted to have a snug sliding fit in the cylinder when cold, so that upon an expansion of the piston its sleeve will automatically yield sufficiently to prevent the piston from sticking in the cyl-

inder, and after the cylinder has also expanded will again automatically resume substantially its normal size and take up the free play between the cylinder and piston, which would otherwise occur" (p. 1 of patent, lines 14-25).

The Court of Appeals held that Petitioners' Piston, Exhibit 1, supra, infringed the Gulick and Maynard patents. The Special Master and the District Court had held (Fact Finding 51, R. p. 1105) that Petitioners' accused pistons were of the prior art.

Through the expedient of pooling many patents Respondent was enabled from 1924 to control the marketing of the type of piston exemplified by Exhibit 1 under and by virtue of the Franquist and Schmiedeknecht patents until their expiration. Notices were issued, suits brought, judgments recovered, injunctions issued upon the Franquist patent. Upon the eve of its expiration, Respondent had issued to it the Gulick patent, application for which had been filed fourteen years before. After the issuance of the Gulick patent, and in order to devitalize the anticipatory effect of Franquist, Respondent repudiated its time-worn contention that the Franquist patent was pioneer and denounced the Franquist patent as being the very opposite of that which was required for aluminum piston construction (Master's Report, Rec. pp. 1121, 1122-3).

In the Petition for Writ of Certiorari Petitioners presented several novel and important propositions of law. Petitioners charged that the Court of Appeals for the Sixth Circuit had failed to apply or had misapplied the decisions of this Court, and that if the decisions of this Court had been properly applied, both the Gulick patent and the Maynard patent would have been held invalid.

One of these propositions, in the belief of Petitioners, will

dispose of the whole case, as narrowed by the Court of Appeals decision. This has reference to the sufficiency of the specifications of the Gulick and Maynard patents to comply with the requirements of the Statute, R. S. 4888.

If According to Permutit v. Graver, 284 U. S. 52, a Patentee Cannot Predicate a Patent Monopoly Upon Something Which is Not Described in His Patent Specification, Can a Patentee Predicate a Patent Monopoly Upon the Very Opposite of That Which Was Described in His Specification as Filed in the Patent Office; Especially Where, After Intervening Rights Arose, the Specification Was Amended to Describe the Very Antithesis of That Which Was Originally Described.

The importance of this proposition, as an abstract question of law, is significantly illustrated by the fact that, at this term of this Court, it has been presented by the Petitions for Writs of Certiorari in two other cases, to wit: United States of America v. Robert Esnault-Pelterie, No. 231, and Wabash Appliance Company et al. v. General Electric Company, No. 712. The Court's decision in No. 231 was predicated upon a different point, and the Court denied the petition in No. 712 so that the Court has not yet expressed its views with reference to the proposition presented here.

In this case it is indisputable that the Gulick patent application, as filed in the Patent Office, described the so-called "webs" as "extremely rigid" (R. p. 1839). It is indisputable that four years and ten months later the Gulick specification was changed (R. p. 1867) to describe the webs "laterally flexible." It is indisputable that in the meantime others had adopted, used, and commercialized aluminum pistons with flexible webs (R. pp. 1102-3). It is in-

disputable that in its decision (R. pp. 2386, 2392) the Court of Appeals for the Sixth Circuit regarded "flexible webs" as the very essence of the piston which that Court found the patents to cover. The Court of Appeals held that Respondent was within its rights in so amending the Gulick specification. Unless this Court approves such a ruling it is thought that it should intercede and review the cases.

The Maynard patent contains no description at all of "flexible webs," and, consequently, as to that patent, this case is indistinguishable from this Court's decision in Permutit v. Graver, 284 U. S. 52. Were it not for the disposition of the Sixth Circuit Court of Appeals to restrict, or to refuse to apply the doctrine of Permutit v. Graver to the same extent which other courts have applied it (vide, cases cited in Petition, p. 9), it would seem inescapable that, if "flexible webs" was an element of the combination patented by Maynard, the patent was invalid under Permutit v. Graver.

The Gulick patent, as issued, does describe flexible webs. As filed, the application for it described the very antithesis of flexible webs. After intervening rights arose the change was made. As to Gulick, therefore, the Court of Appeals' decision involves not only a refusal to apply the doctrine of Permutit v. Graver, but, compounded with that, a disregard of the doctrine of Powers-Kennedy Corporation v. Concrete M. & C. Co., 282 U. S. 175.

Although these points were stressed in the presentation of the case to the Court of Appeals, its decision is strangely silent with reference to the effect of the Permutit v. Graver and Powers-Kennedy Cases. Obviously, if anything had been said by the Court of Appeals with reference to those cases, it would have been unqualifiedly wrong, if consistent with the ultimate decision as to the validity of the patents.

It goes without saying, we think, that if this Court's decision in Permutit v. Graver had come down before the Gulick patent was issued, or before the decisions of the administrative tribunals with reference to Gulick's right to make such antithetical amendments in his specification, the Gulick patent, in its present form at least, would never have been issued.

That this Court has not varied from the doctrine of Permutit v. Graver is emphasized by the fact that as recently as May 16, 1938, this Court applied the doctrine of that case to hold invalid the patent involved in General Electric Company v. Wabash Appliance Company et al., No. 453.

Public Importance.

Contrary to the usual situation in patent cases which this Court may be urged to review, the decision of the Sixth Circuit Court of Appeals in these cases is the practical equivalent of a decision of this Court in so far as its effect upon the aluminum piston industry is concerned. Not only are the automobile manufacturers, the principal users of aluminum pistons, located within the Sixth Circuit, but large numbers of aluminum pistons have been manufactured within the Sixth Circuit, and, furthermore, as pointed out by the Court of Appeals in its decision, the proceedings in these cases have been carried on by Sterling Products Corporation (now called Sterling Aluminum Products, Inc.) of St. Louis, Missouri. Others make less than five per cent of the aluminum pistons made in this country.

As shown in the Motion for leave to file this Petition for Rehearing, the opportunity for Respondent to institute suits prevails in the Seventh, Eighth and Ninth Circuits, but from the standpoint of business prudence, it is unrea-

sonable to expect that Respondent will risk its ninety-five per cent control of the aluminum piston industry in any effort to dispose of the other five per cent. It is unreasonable to think that Respondent has any intention of giving another Circuit Court of Appeals an opportunity to adjudicate the Gulick and Maynard patents. Respondent itself being an inhabitant of the Sixth Circuit, no member of the public can force an adjudication of the patents in another circuit by declaratory judgment proceedings, or otherwise.

In such a situation it is evident that this Court will never have an opportunity to resolve a conflict between decisions of different Circuit Courts of Appeals. In such a situation the general rule of this Court not to take patent cases, save to resolve such a conflict, is unduly harsh upon the manufacturing industry and unjustly favorable to a patentee. Such a rule leaves it within the control of the patentee to say whether this Court shall pass upon his patents.

Wherefore, it is prayed that the Court reconsider the Petition for Writs of Certiorari in these cases and grant the same.

Respectfully submitted,

JOHN H. BRUNINGA,
JOHN H. SUTHERLAND,
Attorneys for Petitioners.

May 21, 1938.

I hereby certify that the foregoing Petition for Rehearing is filed in good faith and not for the purpose of delay.

John H. Bruninga.

FILE COPY

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FILED
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CHARLES ELMORE CROPLEY
CLERK

In the Supreme Court of the United States

OCTOBER TERM, 1937.

THE SCHRIBER-SCHROTH COMPANY,
Petitioner,
vs.
THE CLEVELAND TRUST COMPANY,
CERTAIN CORPORATION,
Respondents.
No. [redacted] 3

THE ABERDEEN MOTOR SUPPLY COMPANY,
Petitioner,
vs.
THE CLEVELAND TRUST COMPANY,
CERTAIN CORPORATION,
Respondents.
No. [redacted] 4

THE F. E. BOWN SALES COMPANY,
Petitioner,
vs.
THE CLEVELAND TRUST COMPANY,
CERTAIN CORPORATION,
Respondents.
No. [redacted] 5

RESPONDENTS' BRIEF OPPOSING PETITIONS FOR REHEARING.

A. C. DENISON,
F. O. RICHEY,
WM. C. MCCOY,
Counsel and Solicitors for Respondents.

THE GAEHE LEGAL PUBLISHING CO., CLEVELAND, OHIO.

In the Supreme Court of the United States

OCTOBER TERM, 1937.

THE SCHRIBER-SCHROTH COMPANY, *Petitioner,* vs. THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*	No. 674.
THE ABERDEEN MOTOR SUPPLY COMPANY, *Petitioner,* vs. THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*	No. 675.
THE F. E. ROWE SALES COMPANY, *Petitioner,* vs. THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*	No. 676.

RESPONDENTS' BRIEF OPPOSING PETITION FOR REHEARING.

A. C. DENISON,
F. O. RICHEY,
WM. C. MCCOY,
Counsel and Solicitors for Respondents.

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In the Supreme Court of the United States

OCTOBER TERM, 1937.

THE SCHRIBER-SCHROTH COMPANY, *Petitioner*, vs. THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*	No. 674.
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THE F. E. ROWE SALES COMPANY, *Petitioner*, vs. THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*	No. 676.

RESPONDENTS' BRIEF OPPOSING PETITION FOR REHEARING.

No point is now presented which was not fully discussed and presented to this Court in the briefs and the Petition for Writ of Certiorari.

No point or fact within the record is mentioned or referred to as having been overlooked by the Court in its denial of the Petition for Writ of Certiorari.

No new fact or circumstance has arisen or is presented in the Petition for Rehearing.

Petitioners now advance only some statistics, newly published in certain newspapers or trade papers, purporting to color some old facts existing prior to and during the pendency of this case. The authorities cited by petitioners do not support an excursion into current newspaper statistics.

The point which petitioners seek to supplement from the current magazines or newspapers is exactly the same point advanced by petitioners at pages 13 and 14 of its Petition, to which respondents replied at pages 5 and 6 of its brief in opposition thereto; the difference being that in the first instance the parties based their arguments on the record, whereas in the present instance petitioners advance the same argument colored with statistics from the current newspapers.

Moreover, the inferences which petitioners now draw from the newspaper statistics are flatly refuted by the evidence in the record. There is no such proportion, as asserted by petitioners, of pistons embodying the inventions of the patents in suit used within and without the Sixth Circuit. Few of the automobile manufacturers make their own pistons. Only a portion of the pistons used in the automobile industry embody the inventions of the patents in suit,* and these pistons, with few exceptions, are licensed pistons. (R. p. 180.) Pistons are made by many manufacturers located outside of the Sixth Circuit. (R. pp. 2, 132, 134, 179.) A great proportion of the pistons sold are not for original automobile equipment but are for replacement by dealers and garage men located in every Circuit of the

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* General Motors, for example, did not use the patented pistons in their regular production of pleasure cars. (R. pp. 179, 262 and 263.) Reo Motor Company and others did not use the patented pistons. (R. pp. 70 and 211.)

United States. (R. p. 143.) The great majority of these replacement pistons are purchased directly from the piston manufacturers and not from the automobile manufacturers. Many other manufacturers, including Diesel and gasoline engine builders, airplane manufacturers, tractor manufacturers, motor cycle engine manufacturers, motor boat and marine engine builders, and other manufacturers using patented as well as unpatented pistons are located in many parts of the United States outside of the Sixth Circuit. (R. p. 211.) It is unimportant that a large proportion of the automobile manufacturers are now located in the Sixth Circuit.

Petitioner cites *Reeke-Nash vs. Swan*, and *Gear Grinding vs. Studebaker*, as examples of litigation confined to one circuit, but in these instances the controlling point was that the entire automobile industry, combining through the Automobile Chamber of Commerce, elected to control the defense in order to gain an omnibus estoppel by judgment in all circuits against the patentee if he were defeated, *Reo vs. Gear Grinding*, 42 F. (2d) 965. In the case at bar the real party in interest, Sterling Products Corporation, a resident of the Eighth Circuit (R. p. 2384), first avoided a commitment of privity with petitioners, and only announced its privity with petitioners when it felt certain of a decision in their favor. At that time Sterling waived its right to stand suit on the merits in the Eighth Circuit, in expectation of enjoying an estoppel in its favor by the Sixth Circuit judgment. Now that the effect of the estoppel is against Sterling, it laments its choice.

Respondents assume that they properly should await termination of a test case in one Circuit before proceeding with duplicate litigation in other Circuits, and that likewise they may withhold litigation until others have had a reasonable opportunity to conform to the rulings of the Court of Appeals of the Sixth Circuit.

As pointed out in our main brief (pages 6 to 19), the only "specification of error" that is urged as controlling in the instant cause is the question of sufficiency of disclosure of the patents in suit. The Court of Appeals of the District of Columbia* and the Court of Customs and Patent Appeals,** both outside of the Sixth Circuit, each found in harmony with the opinion of the Court of Appeals of the Sixth Circuit on this question. What petitioners seek to gain by this Petition, as well as the Petition for Writ of Certiorari, is a review of the question of sufficiency of disclosure as to which three Courts of Appeal already have found in accord with respondents' contention.

CONCLUSION.

We cannot assume with Petitioners that this Court overlooked the instant point when it was presented on the Petition for Writ of Certiorari. Current newspaper statistics can have no additional weight on this point which has been considered and disposed of within the confines of the record of this case.

It is respectfully submitted that the present Petition should be denied.

Respectfully submitted,

A. C. Denison,
F. O. Richey,
Wm. C. McCoy,
Counsel and Solicitors for Respondents.

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* 17 Fed. 2d. 686 C. A. D. C.
** 47 Fed. 2d. 365 C. C. P. A.; 47 Fed. 2d. 367 C. C. P. A.

In the Supreme Court of the United States

OCTOBER TERM, 1937.

THE SCHRIBER-SCHROTH COMPANY,
Petitioner,
vs.
THE CLEVELAND TRUST COMPANY,
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No. 675.

THE F. E. ROWE SALES COMPANY,
Petitioner,
vs.
THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.
No. 676.

RESPONDENTS' BRIEF ON THE SECOND PETITION FOR REHEARING

Upon Petition for Writs of Certiorari to the United States Circuit Court of Appeals for the Sixth Circuit.

A. C. DENISON,
F. O. RICHEY,
WM. C. MCCOY,
Counsel for Respondents.

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In the Supreme Court of the United States

OCTOBER TERM, 1937.

THE SCHRIBER-SCHROTH COMPANY,
Petitioner,
vs.
THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.
No. 674.

THE ABERDEEN MOTOR SUPPLY COMPANY,
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Respondents.
No. 675.

THE F. E. ROWE SALES COMPANY,
Petitioner,
vs.
THE CLEVELAND TRUST COMPANY,
CHRYSLER CORPORATION,
Respondents.
No. 676.

RESPONDENTS' BRIEF ON THE SECOND PETITION FOR REHEARING

Upon Petition for Writs of Certiorari to the United States Circuit Court of Appeals for the Sixth Circuit.

Petitioner presents nothing which has not already been presented to this Court for consideration twice be-

fore (once on the Petition for Certiorari and again on a Petition for Rehearing) except some of the statements contained in the affidavits appearing at pages 5 to 7. Even if evidence could be injected into a cause at this stage for the purpose of a petition for rehearing, as is undertaken to be done in this *ex parte* manner, the evidence attempted to be included in these affidavits is immaterial to any issue involved here, because the affidavits carefully, and apparently designedly, omit to say the only things that could make them material, as follows:

(1) The affidavit of Barac is carefully worded so as to avoid saying that the pistons illustrated in Figs. 1 and 2 are infringing pistons.

(2) In the affidavit of Duncan it is not said that the five per cent of pistons manufactured outside of the Sixth Circuit, or the ninety-five per cent made within the Sixth Circuit, are infringing pistons.

There is no allegation in either of the affidavits that the respondents now know, or ever did know, that the pistons shown in Figs. 1 and 2 were being offered for sale or sold by the Elgin Machine Works, Inc., at Elgin, Illinois, or by the Automotive Warehouse Company of St. Louis, Missouri, or the United Engine & Machine Company of San Leandro, California.

One other point that perhaps ought to be commented upon is the claim that the Court of Appeals was "strangely silent" with reference to the effect of the *Permutit v. Graver* and *Powers-Kennedy* cases. The Court of Appeals in its opinion stated that it could not deal with all of the questions involved in this extensive litigation and that it would limit its discussion to the

"more salient features" (92 Fed. (2) 333). The obvious fact follows, i.e., that the Court considered that there was no merit in the petitioners' contentions regarding the pertinency of these decisions on the facts involved in this litigation. (And see our full discussion of these two decisions in our Brief in Opposition to original Petition pp. 6 to 19.)

For our reply to the other matters presented in the Petition we direct this Court's attention to our briefs filed in opposition to the Petition for Certiorari and the rehearing thereon. For example, with respect to the blackfaced matter on page 13 of the Second Petition for a Rehearing, we call attention to the complete discussion and refutation on pages 6 to 19 of our "Brief for Respondents on the Petition for Certiorari."

The fact asserted on page 11, regarding illustrations there, is not supported by, but is contrary to, the record (R. pp. 177, 178, 203, 204, 246, 247, 254, 458, 460, 496, 528, 529, 536, 537, 552, 553, 554, 560, 567, 934-944, 1040; 1052, 1053, 1078. See also the opinion of the Court of Appeals 92 F. 2d 333 and 334.) Moreover, the earliest date of Schmeideknecht is subsequent to the established and accepted date of invention of the Gulick patent in suit.

Respectfully submitted,

A. C. DENISON,
F. O. RICHEY,
WM. C. MCCOY,
Counsel for Respondents.

May 25, 1938.

Supreme Court of the United States

OCTOBER TERM, 1938.

No. 3.

THE SCHRIBER-SCHROTH COMPANY, *Petitioner*,

v.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*

No. 4.

THE ABERDEEN MOTOR SUPPLY COMPANY, *Petitioner*,

v.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*

No. 5.

THE F. E. ROWE SALES COMPANY, *Petitioner*,

v.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*

PETITIONER'S ANSWER TO RESPONDENT'S MOTION TO AMEND THIS COURT'S OPINION OR IN THE ALTERNATIVE FOR A REHEARING.

I. *As To Amending The Court's Opinion:*

The amendments sought are (1) an expansion of the remanding clause so as to give explicit directions to the court below in three particulars rather than the general directions

which are usually given to proceed in conformity with the opinion of this Court, and (2) to correct some alleged errors in the opinion.

(1) We see no reason for these explicit directions other than to lay a foundation for respondent to argue before the court below that this court *intended* that it should reconsider the patentability of a combination which does not include webs laterally flexible, and which combination that court clearly indicated was not patentable *in view of the prior art*. The request by respondents is plainly an effort to avoid the effect of this Court's discussion of the prior art on page 4 of the opinion.

In addition to the prior art referred to in the opinion of this Court, it will be remembered that all of the claims of the Gulick patent were rejected on January 30, 1922, by the Patent Office, in view of some of the prior art referred to by this Court. Thereupon, the specification was altered to incorporate the feature of webs laterally flexible[1] and it was on that basis that the patent was eventually allowed.

It is contended that the court below could not have considered that webs laterally flexible was an element of such of the claims of the Gulick patent as did not contain it *specifically* and of the claims of the Maynard patent because of the statement in *McCarthy* v. *Lehigh*, 160 U. S. 110. Whether the court below was conscious of that rule or not is of no moment. It did specifically refer to webs laterally flexible as one of the elements of the invention and it indicated clearly that without such an element there was no patentable invention. Therefore, the only reasonable assumption that this Court could make, either as to claim 1 of the Gulick patent or any claim of either patent which does not specifically mention webs laterally flexible, was that the court below had read (in the sense of interpreting or limiting the broad language used in the claims to describe the webs) that element into the claims in order to

[1] R. Vol. IV, pp. 1865-66.

save them. It is well settled that a specification may be referred to in order to interpret a claim or limit it in order to save it[2] and that the phrase "substantially as described" is always implied in claims even though not expressed.[3]

In *Mantle Lamp Co.* v. *Bowman Co.*, 53 F. (2d) 441, the Circuit Court of Appeals for the Sixth Circuit, consisting of Judges Denison, Moorman and Simons, referring to the patent then before the court, said (p. 444):

> "We think also that the always implied 'substantially as described', and the doctrine of interpretation by the specifications, justify regarding the 'bond' of the claim as one which does effectively insulate the outer and inner members. The patent specifies, in line 61 of page 1, that the bonding substance shall be of low heat conductivity, and the succeeding lines emphasize that it is to be incapable of transferring much heat or cold from one to the other. Its 'non-heat transmitting properties' are again emphasized in line 115 of page 2. *To import this limitation into the claim is not to bring in an additional element. It is only to interpret with the aid of the specification one of the words of the claim, so that it may not be thought so broad as to be destructive.*"[4]

In the case at bar, all of the claims of the Gulick and Maynard patents in suit, which do not specifically mention webs laterally flexible, refer to the connection between the bosses and the skirt in varying language.[5] This is, of

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[2] See Walker on Patents (Deller's Edition), Vol. II, §261, p. 1242, and cases there cited.

[3] See Walker on Patents (Deller's Edition), Vol. II, §272, p. 1264, and cases there cited.

[4] When emphasis is used in quotations it will be understood that the emphasis is supplied unless otherwise indicated.

[5] *Gulick Patent:*

Claim 1: The words are "*connected* to the head and to the upper and lower parts of the skirt"; *Claims 11 and 12:* "connecting *flanges* in the zone of the bosses, and extending from the

course, the web. To construe this connection or web as flexible is, to use the language in the case last cited—"not to bring in an additional element. It is only to interpret with the aid of the specification one of the words of the claim. * * *"

In *McCarthy* v. *Lehigh, supra*, the rule above stated is fully recognized. See the part beginning on page 116 and preceding the statement of the rule which is incorporated in the headnote quoted on page 4 of respondents' motion. This Court, in *American Fruit Growers, Inc.*, v. *Brogdex, Inc.*, 283 U. S. 1, 6, said:

> "The claim of a patent *must* always be explained by and read in connection with the specification."

The argument that the court below could not have predicated patentability upon the novelty of any *one* element of the combination simply raises a "straw man." This Court specifically held (opinion p. 5) that "the court below found invention in the Gulick disclosure in a combination of elements, of which one was 'webs laterally flexible' * * *." It is, of course, a well settled rule as stated in the motion (p. 8) that patentable invention may be found in a combination of old elements alone[*] or in a combination of old ele-

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bosses to the skirt * * *"; claim 13: "separated pin bosses having integral *flanges* connecting them with the skirt"; claim 15: "*walls* integrally uniting said bosses, the guide portion * * *"; claim 16: "a pair of spaced *walls*, each of which connects one of said bosses to said cylinder-engaging parts * * *"; claim 30: "*tying means* extending from each of said wrist pin bearings * * *"; claim 33: "*means* integrally connecting each boss to both of said opposite main bearing portions."

Maynard Patent:

Claim 1: "*webs* on diametrically opposite sides of the piston * * *"; claim 6: "a plurality of *webs* integral with said head * * *"; claim 8: "a pair of substantially rectangular shaped webs * * *"

[*] *Loom Co.* v. *Higgins*, 105 U. S. 580 and many other cases.

ments and one or more new elements.'[1] Before the amendment which brought in the lateral flexibility of the webs, the Patent Office held that the old combination did not constitute invention. That the court below reached the same conclusion seems to be clear from its opinion. The combination which included the new element was what the court of appeals held to constitute the invention.

It is urged further that this Court should direct the lower court to apply the same rule to test the sufficiency of prior art disclosures which this Court has applied to the Maynard patent. Why any such direction should be given we are unable to see. The rules of construction of prior art items and the extent and sufficiency of disclosures therein are, of course, well settled. Some of the authorities are collected in Respondents' Motion, pp. 11-13. Any such direction as is asked for might readily be confusing. Every patent or other written disclosure must be construed according to the language used, with due regard to the rule that they are addressed to persons skilled in the art.

Moreover, there is nothing to show that the court below interpreted the disclosures of the prior art differently than this Court intepreted the Gulick disclosures as originally filed and the Maynard disclosures as issued. As we understand the opinion this Court applied neither a "liberal" nor a "strict" rule. It simply held that when Gulick said in his original specification that the webs provided "an extremely rigid connection between the piston pin bosses and the skirt" and made other statements to the same effect, it was not permissible for him to thereafter change the specifications so as to describe such webs as flexible, especially in the light of the testimony of respondents' own expert to the effect that inherent flexibility cannot be depended upon in the absence of correct proportioning of the different parts. So far as Maynard is concerned, it is not

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[1] *Leeds & Catlin* v. *Victor*, 213 U. S. 301, 330; *Lyman Mfg. Co.* v. *Bassick Mfg. Co.*, 18 F. (2d) 29, 33 (C. C. A. 6th—Judge Denison).

disputed that there is not a word in the specifications about the webs being laterally flexible. These considerations make a discussion of the prior art referred to by respondent unnecessary and, indeed, out of place.

Quite apart from what has been said, respondent cannot complain of the remanding part of this Court's opinion because this Court would have been fully justified in directing that the court below treat the Gulick patent as invalid because of the amendment made to the specification. We now urge the Court to do so.[8] The specification of the Gulick patent as now issued contains an amendment which this Court has held it was not permissible to make because there was no basis for it in the specification as originally filed. Rule 70 of the Patent Office is as follows (p. 998):

> "In original applications all amendments of the drawings or specifications, and all additions thereto, must conform to at least one of them as it was at the time of the filing of the application. Matter not found in either, involving a departure from the original invention, can not be added to the application even though supported by a supplemental oath, and can be shown or claimed only in a separate application."

Consequently, if the decision of this Court had been before the Patent Office, the patent could not have issued with the amendment. As previously stated, the amendment was deemed essential for the allowance of the patent. It must logically follow, therefore, that the amendment has invalidated the patent *in toto*. This is, as we construe it, what was held by this Court in *Powers-Kennedy* v. *Concrete Co.*, 282 U. S. 175, 185. In the case of *American Bell Tel. Co.* v. *National Tel. Mfg. Co.*, 109 Fed. 976, 1005 (C. C. Mass.), the reason why an improper change in the specification should invalidate the whole patent is thus stated:

> "I am of the opinion that this patent is invalid for the reasons that the power to amend an application

[8] This Court is also justified in holding the Maynard patent invalid because, without the flexible web element, it did not exhibit any invention over the prior art.

does not include the power to change the nature of the invention; that the right to amend or the right to complete an application under section 4894, Rev. St. U. S., does not give the right to transform completely; that the only remedy for a radical mistake in substance so serious as to require a transformation so complete as is here shown is a new application."

The amendment to the Gulick Application was not only to the claims but to the description by changing "extremely rigid" to "laterally flexible." This not only changed the description of the structure but also the principle of operation. The specification does not comply with R. S. 4888, 35 USC 33, because it does not contain "a written description" of the Gulick piston as filed and does not "explain the principle thereof and the best mode in which he has contemplated applying that principle." The patent is, therefore, just as void as if it had never contained a written description or had never explained the principle.

Morecver, the rule is abundantly settled that claims predicated upon unlawful amendments to the specifications are invalid. *Insulite Co.* v. *Reserve Supply Co.*, 60 F. (2d) 433 (C. C. A. 8); *Boyce* v. *Stewart-Warner Speedometer Corporation*, 220 F. 123 (C. C. A. 2nd); *Standard Oil Development Co.* v. *James B. Berry Sons Co., Inc.*, 92 F. (2d) 386 (C. C. A. 3rd); *Kwik-Set* v. *Welch Grape Juice Co.*, 14 Fed. Supp. 137; Rev'd on other grounds, 86 Fed. 945); *The Chicago and Northwestern Railway Company* v. *Thomas Sayles*, 97 U. S. 554; *Eagle Mfg. Co.* v. *West, Bradley & Cary Mfg. Co., et al.*, 111 U. S. 490; *Western Electric Co.* v. *Wallerstein*, 51 F. (2d) 529; *Pomeroy* v. *Walker*, 64 F. (2d) 544; *Bonnot Co.* v. *Lopulco Systems*, 15 F. (2d) 848.

As the Patent Office refused allowance of any claims before the amendment, and since any claim which does not expressly or impliedly contain the subject matter of the amendment, was plainly foreshadowed by the prior art, it necessarily follows that the whole patent must be invalid, because a patent without valid claims is a legal impossibil-

ity. Whether the defect in the patent may be cured by disclaimer or reissue we need not now consider.

(2) *Suggested Corrections.*

We will discuss the suggested amendments of the opinion with reference to the letters used in respondents' motion (pp. 18-20).

(a) The statement in this Court's opinion as to claims 18 and 33, we think is entirely accurate. One of the elements "whereby said skirt is yieldable" (claim 18) is "a pair of spaced walls" (p. 3, line 117). These walls are the laterally flexible webs. Webs are treated as synonymous with walls in this Court's opinion on page 3.* They are also thus referred to in the patent, page 1, line 63.

The portion of claim 33 quoted in the motion recites only part of the elements that render the skirt wall yieldable. One of the other elements is "means integrally connecting each boss to both main bearing portions". This latter is, of course, the lateral webs.

(b) The alleged mistake referred to under (b) is immaterial. The fact is that the pooling agreement involves only one individual inventor, an automobile manufacturer and several manufacturers of aluminum pistons.

(c) The part of the opinion referred to under (c) is entirely correct. We refer to this under the next point.

II. *As To The Rehearing:*

We will answer the petition with reference to the subject matter under "A" and "B" of the petition, respectively.

A.

(a) We have already answered the grounds advanced in paragraphs 1, 2 and 4.

*"The piston head and skirt are connected by two 'webs' or walls extending longitudinally through the interior of the skirt".

(b) There is nothing in the evidence to show that the drawings of either the Gulick or Maynard patents are to scale, and this Court so found (Opinion, p. 6). As a general rule, patent drawings are not to scale. At any rate, this whole matter has been fully discussed in respondents' brief and our reply brief (See the latter, pp. 8-10; Resps.' Br. pp. 34-35).

B.

(a) This Court is now asked to change its conclusion that there was not a sufficient basis in the Gulick application as filed to justify the amendment that was made. The contention is that certain articles appearing in publications referred to in the record are no more explicit "to teach those skilled in the art how to make the pistons illustrated and described in these articles and how to operate them to make their principles available to the public" than the specifications of the patent in suit. Initially, it should be noted that none of these articles are relied upon by either this Court or the court below as part of the prior art. It is, therefore, quite impossible to see the relevancy of the present contention. But quite apart from that, the amendment was unlawful because its language was the very antithesis of that used in the specification as originally filed. This was considered and fully discussed by this Court (p. 8 of Opinion).

It is respectfully submitted that the motion should be denied.

Respectfully submitted,

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December 8, 1938.

In the Supreme Court of the United States

OCTOBER TERM, 1938.

THE SCHRIBER-SCHROTH COMPANY, *Petitioner,* vs. THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*	No. 3.
THE ABERDEEN MOTOR SUPPLY COMPANY, *Petitioner,* vs. THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*	No. 4.
THE F. E. ROWE SALES COMPANY, *Petitioner,* vs. THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, *Respondents.*	No. 5.

On Writs of Certiorari to the United States Circuit Court of Appeals for the Sixth Circuit.

RESPONDENTS' MOTION (1) TO EXPAND THE ITEMS REMANDED TO THE COURT OF APPEALS AND TO AMEND THE ORDERING CLAUSE OF THIS COURT ACCORDINGLY AND (2) TO MAKE CERTAIN CORRECTIONS IN THIS COURT'S OPINION OR, IN THE ALTERNATIVE, A PETITION FOR REHEARING.

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ON WRITS OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT.

RESPONDENTS' MOTION, (1) TO EXPAND THE ITEMS REMANDED TO THE COURT OF APPEALS AND TO AMEND THE ORDERING CLAUSE OF THIS COURT ACCORDINGLY AND (2) TO MAKE CERTAIN CORRECTIONS IN THIS COURT'S OPINION OR IN THE ALTERNATIVE, A PETITION FOR REHEARING.

Now Comes the respondent in the above entitled cause and moves this Court (1) to amend the ordering clause occurring at the end of this Court's opinion, dated

November 7, 1938, handed down in these causes; and (2) to consider what seem to respondent to be errors in the opinion, either as they affect further proceedings below, or in the alternative, as they justify rehearing thereon.

The ordering clause of this Court's opinion in these causes, dated November 7, 1938, is as follows:

> "As the Court of Appeals did not pass upon other questions in the case, the causes will be reversed and remanded to it for further proceedings, in conformity with this opinion, with respect to such claims of the patents in suit as appellant below submitted to that court for adjudication."

I. We pray the Court to supplement this ordering clause by adding to the matters remanded to the Court of Appeals, partly to clarify, expedite and simplify the further proceedings there, the following:

(A) "but if the Court of Appeals did not read 'web flexibility,' 'laterally flexible' webs, or any other elements into any of the claims of either the Gulick or the Maynard patents ruled upon, as this Court, has assumed that the Court of Appeals did, then the Court of Appeals shall, after so declaring, review such claims on the assumption that such elements are not in such claims; and if the Court of Appeals did read such element or elements into any such claim or claims, then the Court of Appeals is directed to reconsider the question of patentability of such claim or claims without reading such element or elements into such claim or claims."

and

(B) that the Court of Appeals, in the further consideration of the causes by that Court, apply to the prior art the same rules on sufficiency of dis-

closure that this Court has applied to the Maynard patent in its opinion of November 7, 1938, and that the Court of Appeals thus review the prior art without restriction by what this Court has said about any item of the prior art.

II. We pray that this Court further consider those points in the opinion which we point out in Part II of this Motion, as seeming to us erroneous, and thereupon either modify appropriately the instructions for further hearing below, or in the alternative, grant a rehearing thereon.

FOREWORD.

Upon the questions which respondent understood to be presented by the petition for certiorari and which respondent's counsel argued fully, respondent does not feel justified in asking a general rehearing on those questions; but the cases are remanded for further consideration by the Court of Appeals, and it is hoped that the extent of that further consideration is not foreclosed by any implications from the opinion of this Court,—hence the perhaps unusual character of this application.

It seems that we should call attention, in a preliminary way, to a particular feature of the opinion which may seem to this Court of importance, as affecting the further proceedings. The Court selected claim 39 of the Gulick patent for discussion, so that the language of that claim served more or less as the basis upon which the Court reached its conclusions. *Claim 39 was not in suit and had never been presented to or considered by the Court below.* It differs materially from the claims which were in suit.

PART I.

(A) This Court said at the end of its opinion and just preceding the ordering clause, as follows:

> "We assume that it [meaning the Court of Appeals] sustained claim 1 of the Gulick patent which makes no mention of web flexibility, only by reading into it that element, which the Court regarded as an essential part of the invention." [1]

It has always been the rule that an element cannot be read into a claim.

This Court early stated the rule as follows, to quote the syllabus, in the early case of *McCarty v. Lehigh,* 160 U. S., 40 L. Ed. 358:

> "An element not mentioned in a claim for a patent cannot be read into the claim for the purpose of making out a case of novelty or infringement."

Since the Sixth Circuit Court of Appeals has followed this rule even in very recent decisions, many of which were written by Judge Simons, the same Judge who wrote the opinion in the instant causes (see *Smith v. Petroleum,* 73 F. (2d) 531, 536; *Wadsworth v. Westinghouse,* 71 F. (2d) 850; *Chicago v. Bade,* 63 F. (2d) 928; *Cincinnati v. English & Mersick,* 18 F. (2d) 542, 543), may not the Court of Appeals rightly feel that it should not have been thought to have read the web, flexible or otherwise, into claim 1 of Gulick, or to have read any element into any other claim in suit, where such element was not already in the claim, or rightly feel that

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[1] To much the same effect are other statements in this Court's opinion such as that in the beginning of the same paragraph from which the last sentence was quoted and which is as follows:

> "we construe the Court's opinion as including the laterally flexible web as an essential element in the patented combination."

it really intended to hold the claims valid as they are and without reading any element into them?

Suppose, therefore, that the Court of Appeals *did not* read, or did not intend to read, the web or "web flexibility" or "laterally flexible webs" into claim 1 of the Gulick patent, for example. Should the Court of Appeals now be bound to assume that it *did* read the web or the web flexibility into claim 1 because this Court assumed (and, by hypothesis, erroneously) that the Court of Appeals had done so, or is it not more appropriate that the Court of Appeals be at liberty to proceed on the basis (by hypothesis, the true basis) that it *did not* intend to read that element into any of the claims?

To state the matter summarily, the Gulick and Maynard patents contain the following three kinds of claims:

(1) claims such as claim 1 of Gulick, which do not specifically recite any "web" at all,

(2) claims such as the claims of Maynard, and Gulick claims 11, 12, 13, 15, 18, 30, and 33, the other Gulick claims ruled upon by the Court of Appeals, which recite the webs, but do not recite the flexible feature of the webs, and

(3) claims like claim 39 of Gulick which were not in suit, but which recite both the webs and the flexible feature of the webs.

Only claims of the first two groups were presented for consideration and review in the Court of Appeals and it was only such claims that were considered. If the Court of Appeals read the web into the first group, or read the flexible feature of the web into the second group as an element, then that Court violated the rule of *McCarty v. Lehigh*. If the Court of Appeals did disregard that rule, then it seems to us that it should

be reversed *for so doing,* and be directed to reconsider the claims without reading elements into the claims in violation of the rule of this Court in *McCarty v. Lehigh* and the practice established thereby and followed since.

If the Court of Appeals followed *McCarty v. Lehigh* and did *not* read the web into the first group of claims and did *not* read the flexible property of the web or a flexible web element into the second group of claims, as this Court has assumed it did, then would not the Court of Appeals rightly feel that it should have an opportunity so to declare, and then to consider the claims as they read, and unembarrassed by any supposed "reading in" of the flexible feature of the web element?

In other words, as the matter stands, the respondent has had no review of the issue which was presented to the Court of Appeals [1] (the validity of the claims as they read), unless this Court is wrong in assuming that the elements were read into the claims by the Court of Appeals and, in that event, this Court has reversed the Court of Appeals on something that the Court of Appeals did not rule upon.

The matter is of special importance here, as this Court has ruled against respondent because of "lack of disclosure," in the specification, of matter which is not included in any claims passed upon by the Court of Appeals, and the claims thus ruled upon by that Court were based upon and justified by the original disclosure (Gulick and Maynard). No claim passed upon by the Court of Appeals contained or was based upon the mat-

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[1] See reference to Claims 18 and 33 on p. 19, *infra,* which did not include web flexibility.

ter which this Court has found was not disclosed in the original specifications.

Would not the Court of Appeals rightly think that it would know whether or not it had read such elements into such claims, though in violation of the rule of *McCarty v. Lehigh,* well known to and practiced by that Court? *Is it not reasonable, under the circumstances, and from the viewpoint of the Court of Appeals that it should have the opportunity to say whether or not it had departed in the instant causes from the rule of McCarty v. Lehigh and its established and common practice of following that rule?*

A second assumption made by this Court regarding the holding of the Court of Appeals, as we understand this Court's opinion, was that the Court of Appeals regarded "the lateral flexibility of the webs" to be "the only feature mentioned not within the prior art or within the expected skill of the art" (see p. 5 of this Court's opinion). We respectfully urge that the Court of Appeals did not predicate patentable invention upon the novelty or lack of novelty of any one element of the combination, and that the Court of Appeals did not look upon any one element as the main point and gist of the invention; but rather that the Court of Appeals regarded the invention as residing in the whole combination of the various specified elements, whether individually old or new, and regarded the combination of elements defined in the claims passed upon as the essential thing constituting invention, as indeed the Court of Appeals said.

That this was the real view of the Court of Appeals seems to follow from its statement (92 F. (2d) 333):

> "The Gulick patent is *for a combination of elements,* many, *if not indeed all of which, are to be found in the prior art.* Nowhere, however, is found his precise organization, and the question at once presents itself as to whether there was exercise of the inventive faculty in the concept of their combination, for that a new result was achieved and a new mode of operation of an aluminum piston in its iron cylinder brought about is not successfully challenged on this record."

Not only was this view the one taken by that Court in the instant causes, but it had consistently so held in a long line of decisions, some of which are written by Judge Simons, and some by other Judges who sat in these causes below. In so ruling, the Court of Appeals has followed the rule early established by this Court (*Loom Company v. Higgins,* 105 U. S., 580; 26 L. Ed., 1177) and followed by this Court throughout (*Expanded Metal v. Bradford,* 214 U. S., 366; 53 L. Ed., 1034) to the effect that a new combination of old elements may be patentable no matter whether all of the elements are old, whether all but one are old, and whether part are old and part are new (*National v. Richardson,* 63 Fed. (2) 292; *International v. Remington,* 78 Fed. (2) 606 and *Monarch v. Dennison,* 92 Fed. (2) 90).

Moreover, that Court has consistently held and recently definitely reannounced that *no one element* in such a combination constitutes the invention or contributes novelty to the combination, but that it is the combination that constitutes the invention and that is novel. In other words, as has long been the rule, the combination of the elements makes *a new thing* that is separate and distinct from the individual elements of the

ombination. (*Automotive Parts v. Wisconsin,* 81 Fed. 2) 125, 126).[1]

Should it be assumed that the Court of Appeals did ot follow these rules of law in the instant causes? Does ot its opinion rather indicate that in the instant causes t regarded the *combination* of elements recited in the laims as *the new thing,* regardless of the novelty or ntiquity of any of the elements taken individually, and hat it found these combinations patentable because of he history of the inventions, their achievements, the new esults and the new mode of operation obtained by the ombination of elements defined in the claims sustained? —as indeed that court carefully and expressly said. Do ot the statements made by Judge Simons on pages 334 nd 335 of 92 Federal Reporter (2d) sufficiently estab- ish these conclusions?

Be these things as they may, is it not reasonable that he Court of Appeals should be permitted to say whether it regarded the inventions of the patents in suit o be found solely in the web flexibility,—the flexible veb,—or rather in the combination of elements recited n the claims sustained?

This question of the patentability of the claimed com- inations was not presented to this Court by the petition,

[1] Judge Moorman, speaking for the Court (Moorman, Simons and Allen) said:

> *"The invention is for a composite thing, embracing several elements or parts, all of which are necessary to and cooperate in the operation of the patented unit.* We cannot subscribe to the view that the test of contributory infringement in the furnishing of parts for a combination invention is whether the parts furnished constitute the gist or essence of the invention; indeed, *we cannot see how it may be said that any one element or another marks the advance step or is the essence of such an invention."*

and has never been duly brought before this court.[1] It becomes apparent upon a consideration of the opinion of the Court of Appeals that this question was determined by that Court only after a careful consideration of voluminous testimony regarding history, operations and achievements, as well as careful consideration of the patented and the prior art structures; and is it not true that such question cannot fairly be considered without a full consideration of this evidence?

At all events, is the situation so urgent that the Court of Appeals must be finally and forever assumed to have violated both of the cardinal rules of McCarty v. Lehigh and Loom Company v. Higgins, or should that Court be given an opportunity to make clear whether it did or did not so violate these rules,—especially when for years that Court has been consistently and carefully following these two rules so promulgated by this (the Supreme) Court in these two cases?

Moreover, since the causes are remanded to the Court of Appeals for further proceedings, these matters, we submit, should be clarified since they also bear upon the other subject-matter to be considered on the remand.

(B) As this Court said at page 2 of its opinion, the Courts in the District of Columbia relied upon the rule of sufficiency of disclosure followed in the "interference proceedings" which we will here call for short and for better convenience the "liberal rule"; at the same place, this Court found that the Master relied upon the rule of sufficiency of disclosure stated in the decisions of this Court in *Permutit v. Graver* and *Powers v. Concrete*,

[1] It was expressly disclaimed by petitioner's counsel on the oral argument.

which we will here call for short and for greater convenience the "strict rule."

The Court of Appeals used the first or "liberal rule" in its interpretation of the disclosures of both (1) the prior art and (2) the patents in suit. (Where we refer to the disclosure of the Gulick patent in this connection we mean the disclosure without the 1922 amendment.)

This Court rejected the application of the "liberal rule" to the patents in suit, reversed the Court of Appeals and the District of Columbia Appellate Courts and applied the "strict rule" to the patents in suit; on the other hand, this Court accepted the Court of Appeals' interpretation of the prior art which had been under the "liberal rule."

It results that the matter now stands decided with the patents in suit interpreted by the "strict rule" and the prior art interpreted by the "liberal rule."

This is wrong; both must be interpreted by the same rule, i.e., the "strict rule" under this Court's decision.[1]

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[1] That the requirements for sufficiency of disclosure in the prior art are the same as for the patent in suit was early established and has since been followed by this Court.

In the *Cawood* patent case, 94 U. S. 695, this Court, speaking through Mr. Justice Strong, said (p. 704):

> "That, however, evades the question to be answered, which is, whether the specification was sufficient to enable a mechanic skilled in mechanical arts to construct and carry into practical use the Cawood machine; or, *in other words, whether whatever is essential to the Cawood machine could be read out of the prior specification.* We think no such information was given by the English patent."

In *Seymour v. Osborne*, 11 Wallace, 516, this Court, speaking through Mr. Justice Clifford said (78 U. S. 555):

> "Patented inventions cannot be superseded by the mere introduction of a foreign publication of the kind though of prior date,

For example, the Ebbs patent 700,309 (R. p. 1673), and the Long patent, 1,872,772 (R. p. 1773) are as barren of description of "flexibility of the skirt" which this Court considered to be disclosed by them (p. 4 of this Court's opinion) as the patents in suit are barren of description of "flexibility of webs,"—indeed more so. (See Appendix A and the cut adjacent the back cover of this brief.)

The Van Bever patent 1,031,212 (R. p. 1681) is likewise barren of description of flexibility of the skirt in the completed piston. It is true that this Van Bever patent refers to "spring capacity," but only in connection with the piston in its intermediate or incompleted stage.

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unless the description and drawings contain an exhibit a substantial representation of the patented improvement, in such full, clear and exact terms as to enable any person skilled in the art or science to which it appertains to make, construct and practice the invention to the same practical extent as they would be enabled to do if the information was derived from a prior patent. Mere vague and general representations will not support such a defense, as the knowledge supposed to be derived from the publication must be sufficient to understand the nature and operation of the invention, and to carry it into practical use. Whatever may be the particular circumstances under which the publication takes place, the account published, to be of any effect to support such a defense, must be an account of a complete and operative invention capable of being put into practical operation. *Web. Pat. Cas.* 719; *Curt. Pat.* (3d ed.), sec. 278, a; *Hill v. Evans*, 6 Law. T., N. W., 90; *Betts v. Menzies*, 4 Best & S., Q. B., 999."

In *Downton v. Yeager Milling Company*, 108 U. S. 466, the rule was reaffirmed, to quote the syllabus:

> *"The doctrine reaffirmed that the earlier printed and published description of a subject of a patent which is put in evidence to invalidate a patent must be in terms that would enable a person skilled in the art or science to which it appertains to make, construct and practice the invention as completely as he could do by the aid of information derived from a prior patent*; and that unless it is sufficiently full to enable such person to comprehend

When completed, the "spring capacity" is *so locked as to destroy all flexibility.*

All of the other art discussed or mentioned by this Court and the Court of Appeals is barren of description of "flexibility of the skirt," unless that feature can be imported into the disclosure of such prior art patents through such words and phrases as appear in the descriptions of the inherently flexible webs of the patents in suit. (A more complete discussion of this subject is found in the Appendix A.)

None of the drawings of these prior art patents show dimensions, so that the drawings may not be resorted to

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it without assistance from the patent, or to make it or repeat the process claimed, it is insufficient to invalidate the patent."

In *Eames v. Andrews,* 122 U. S. 40, the rule was followed (p. 66):

> "The same rule was repeated by Mr. Justice Strong in the opinion of the court in *Cohn v. United States Corset Co.*, 93 U. S. 366, 370, as follows: 'It must be admitted that, unless the earlier printed and published description does exhibit the later patented invention in such a full and intelligible manner as to enable persons skilled in the art to which the invention is related to comprehend it without assistance from the patent, or to make it, or repeat the process claimed, it is insufficient to invalidate the patent.' This rule was affirmed in *Downton v. Yeager Milling Co.*, 108 U. S. 466, 471."

The rule expressed by this Court in the above authorities has not only been followed throughout the Courts of Appeals and the District Courts, but it has become textbook law (see *Walker on Patents,* Deller Edition, pp. 270-272). Thus Walker says (p. 270):

> "Novelty is not negatived by any prior patent or printed publication, unless the information contained therein is full enough and precise enough to enable any person skilled in the art to which it relates, to perform the process or make the thing covered by the patent sought to be anticipated."

This, as well as the quotations copied from the opinions of this Court, are merely paraphrases of the Statute R. S. 4888 which this Court paraphrased in almost the same language at page 7 of its opinion in the instant causes.

in order to supply the omission, any more than in the case of the patents in suit. Indeed, most of the drawings of these prior art patents appear to be more indefinite than the drawings of the patents in suit, since the evidence shows that the drawings of the patents in suit proved to be scale drawings and there is no evidence that these prior art patents show scale drawings. Each of the parties used the drawings of the Gulick patent and produced the pistons plaintiff's Exhibit 20 and defendant's Exhibit 3-T (R. pp. 155, 156, 192, 193, 255, 256, 240, 568, 860 and 863),—both of which have flexible webs.

Nor can any of the prior art be rescued from the application of the "strict rule" by any admission made during the trial that any of them embodies what their disclosures omit, for there are admissions equally binding that the patents in suit disclose "flexibility of webs" to those skilled in the art (R. pp. 155, 156, 201, 240 and 568).

What we have said about the absence of disclosure of "flexibility of skirt" in the cited prior art under the "strict rule" applies to nearly all of the items which the Court of Appeals mentioned in discussing the Gulick invention at 92 Fed (2) 334, quoted by this Court at page 3 of its opinion and relied upon for the assumption that web flexibility must be read into the claims in suit.

We have analyzed this discussion and itemized the features recited therein. They are as follows:

"But to combine";

(1) "insulation of head from skirt"

(2) "retraction of the bosses from the skirt periphery"

(3) "connection of such bosses to the skirt with webs laterally flexible and"

(4) (connection) "yet so carried from the head as to support the load upon the wrist pin with sufficient strength and rigidity and"

(5) "to utilize the mechanical force of the cylinder wall upon the skirt"

(6) "and" (to utilize) "the thermal expansion of the bosses so as to compensate evenly and fully for head expansion and"

(7) "to secure a balanced flexibility of the skirt with no bending concentration at any point therein."

Except for item (1), which is disclosed in the text of the Spillman & Mooers patent, we find none of these items disclosed in any of the prior art patents to Ebbs, Van Bever, Franquist, Spillman & Mooers or in the subsequent Long Patent 1,872,772 of 1932, unless resort be had to the drawing or to the knowledge of the art, that certain properties would be inherent, to import them into one or more of such patents. Item (2) might be found in the Spillman & Mooers patent by referring to the drawing thereof, but there is nothing in the specification to support its presence. Item (5) might be imported into the Franquist disclosure to a degree too limited to be successful, as the record shows, if Franquist were favored with a liberal interpretation of language, now denied to Gulick and Maynard as we show in Appendix A. Items (3), (4), (6) and (7) are not only not found in these patents, but cannot be found there even if resort be had to the drawings and to any knowledge of the inherent properties of metals.[1]

[1] The combination of the elements or features cannot be found in any prior art disclosure even though resort might be had to drawings and inherent properties. Nor was it within the skill of the art as the many

When we come to Maynard we find that not only is what we have said about the Gulick items true, but the additional items named by the Court of Appeals as employed by Maynard, which are as follows:

(a) "webs about two-thirds of the length of the skirt"

(b) omitted the skirt for the length of the webs

(c) continued the skirt "circumferentially below the webs except for a single vertical slot throughout one bearing face of the skirt" (92 Fed. (2) 337)

are not to be found in the prior art cited by the Court of Appeals and this Court. Not only are they not disclosed in the specifications, but neither resort to the drawings nor to the knowledge of what is inherent in the constructions of such art justifies their importation into any item of this prior art, by either the "strict" or the "liberal" rule.[1]

Therefore, in common parlance, each of the prior art patents referred to by this Court and by the Court of Appeals "is in the same boat" with the patents in suit,

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[1] The combination of the elements or features cannot be found in any prior art disclosure even though resort might be had to drawings and inherent properties. Nor was it within the skill of the art as the many efforts and failures in this country and abroad, not only by engineers but by mechanics skilled in the art amply establishes, as described by the Court of Appeals at 92 Fed. (2) 334 and 335 and throughout the record. As petitioner's expert said, "There was a crying demand for an aluminum piston that would work with a minimum clearance." (R. p. 458.)

(Continued from p. 15.)

efforts and failures in this country and abroad, not only by engineers but by mechanics skilled in the art amply establish, as described by the Court of Appeals at 92 Fed. (2) 334 and 335 and throughout the record. As petitioner's expert said, "There was a crying demand for an aluminum piston that would work with a minimum clearance." (R. p. 458.)

and since the rule is that "sauce for the goose is sauce for the gander" the "strict rule" must be applied to the prior art as well as to the patents in suit.

Since the causes stand remanded by this Court to the Court of Appeals on other questions, and since we have never had a review by the Court of Appeals of these causes on the basis of the "strict rule," we have, as an alternative to applying for a rehearing, made this motion to remand this question to the Court of Appeals along with the other questions already remanded to that Court and to which this question is closely allied. In doing this we have partly been actuated by a realization that it can, perhaps, be more economically and expeditiously done by the Court of Appeals which is already familiar with the prior art and need only reconsider it in connection with the "strict rule" of interpretation.[1] Moreover, it is apparent that at least some of this prior art, if not all of it, must be reviewed by the Court of Appeals in connection with the other questions already remanded to it.

We have adopted this course notwithstanding it makes it necessary for us in effect to ask this Court to tell the Court of Appeals to disregard this Court's statements regarding the prior art in this Court's opinion. We make this request with all deference; nevertheless, we are confident that this Court would not want the Court of Appeals to read "flexibility of the skirt"[2] into such patents as the Ebbs patent when, under the "strict rule," "flexibility of the web" cannot be read into the patents in suit. The disclosure of the Ebbs patent is to be found at page

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[1] The Court of Appeals considered the prior art in connection with the question of invention, a question admittedly not before this Court.

[2] Or other feature.

1673 of the record. We invite the Court to consider the one page which embodies the whole disclosure. It will be readily seen that not only is "flexibility of the skirt" not disclosed, but it is not even contemplated.

The matter is important since only by applying the "liberal rule" and by thus importing matter into the prior art, could it be assumed that the disclosures of the prior art were sufficient to impose on the patented claims the limitations which result from reading in "flexibility of web." If the "strict rule" is applied to the prior art the matters imposing those limitations on the claims in suit are not found in the prior art. Therefore, if the "strict rule" is applied to the prior art, as well as to the patents in suit, the claims in suit are valid without reading "web flexibility" into them.

Even assuming that there could be any dispute on this question, it is a question which has never been reviewed by the Court of Appeals and should be considered by it.

We, therefore, ask this Court to direct the Court of Appeals to reconsider the claims of the patents in suit, applying the "strict rule" to each of the prior art patents, as well as to the patents in suit.

PART II.

Suggested Corrections in the Opinion.

(a) The Court says at the end of the first full paragraph on page 4:

> "Reference to the means, the webs, connecting the head to the split skirt as being 'yieldable' in response to lateral cylinder wall pressure appear in claims 18 and 33."

The term "yieldable," appearing in claims 18 and 33, applies to the *skirt* and not to the *webs*, as we read the

claims and as we understand that they have been read. The only place where the term "yieldable," or its equivalent, is used in either of these claims is in the following language.

In claim 18:

> "whereby said piston *skirt* is rendered yieldable during operation in response to cylinder wall pressure"

and in claim 33, after defining the *skirt* as having "oppositely positioned main bearing portions" the claim concludes:

> "and the other main bearing portion being separated from the head and split longitudinally between its connections to the bosses to render *said slit main bearing portion* yieldable in response to pressure from the engine cylinder during operation."

(b) On the first page of its opinion of November 7, 1938 this Court said that

> "Respondent is the assignee in trust, under a pooling agreement among a number of automobile manufacturers, of some eighty patents relating to pistons employed in internal combustion engines."

Only one automobile manufacturer is in the agreement; the others are individual inventors and makers of aluminum pistons. The sentence would be correct if it read:

> "Respondent is the assignee in trust, under a pooling agreement among a number of individual inventors, a number of piston makers and one automobile manufacturer, of some eighty patents relating to pistons employed in internal combustion engines."

(c) This Court said at page 6 of its opinion:

> "Neither drawings nor specifications give dimensions showing thickness or other proportions which might suggest a flexible structure."

and at page 9:

> "As already indicated, the omission from the specifications was not supplied by the drawings, which fail to disclose by dimensions the proportions of the webs."

There are two ways of giving dimensions and proportions in drawings, as is well known. One way, and the less common way, is to place the figures indicating the dimensions on the drawings. This practice was followed, for example, in the early Gulick drawing (R. pp. 1862 and 1363) and in the drawing of Exhibit 22 (R. p. 1339).[1] The other way, and the more common way, is to make the drawings "to scale," as it is called, so that one who wishes to reproduce what is shown in the drawings merely has to measure the dimensions of the parts to get their finite and relative dimensions and the proportions and relations of the parts to each other (see Appendix B).

One advantage of the scale drawing over the merely dimensioned drawing is that when the drawing is a scale drawing, the disclosure may be reproduced in the actual shape and size illustrated in the drawing, and also may be halved, doubled, tripled, or made to any size by merely halving, doubling, tripling, or otherwise consistently modifying the measurements of the parts as shown when the parts are scaled. Each Gulick and Maynard shows a "scale drawing." The

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[1] Indeed, the dimensioned Gulick drawing shown at page 1363 was before Gulick's solicitor at the time his application was prepared (R. pp. 860, 861, 864 and 868), but because it was a scale drawing the dimensions were omitted as unnecessary and because, to a certain extent, they "litter up" the drawing and make it less clear, especially when the reference numerals necessary to the description in the specification are added to the dimensioned drawings.

record shows that if one scales the drawings of either Gulick or Maynard and reproduces a piston on that scale, modified by any factor, no matter whether it be one-half, one, two, or other number, a piston will result which will operate successfully in an internal combustion engine to perform the desired functions, including flexing of the webs (R. pp. 155, 201, 568). Both parties did, by copying the Gulick drawings, make Gulick pistons which do what is claimed for the Gulick pistons (Exhibits 3T and 20 and R. pp. 155 and 240), while the record shows that millions of pistons like the Maynard drawing were made and used successfully (R. pp. 68, 71, 77, 78, 81, 88, 130, 132, 135, 462, 471 and 955).

We think it would be helpful in the further prosecution of this case in the Court below if this Court would say whether it is sufficient to follow the practice of showing scale drawings, or a drawing that can be scaled to produce the device, or whether the inventor must show the dimensions of the parts in his patent drawings.

If dimensions must be used, are those who followed the scale drawing practice in the past and did not show dimensions but, on the contrary, showed "scale drawings," to be penalized for doing so?

It follows that the matter is of general importance, as well as of special importance to these causes.

All we ask this Court to do, in Part I of this motion, is to give the Court of Appeals during the remanded proceedings an opportunity to say whether or not they have continued to follow this Court's rulings, and for leave to apply the same rule of interpretation to the patents in suit and the prior art alike.

Wherefore it is prayed that each of the foregoing motions be allowed.

PETITION FOR REHEARING.

Petition for Rehearing and in the event that any of our motions hereinbefore presented are denied, we pray this Court for a rehearing on the questions presented by the motions denied and for the reasons stated therein for the allowance of such motions, which reasons succinctly are as follows:

A.

(1) The Court of Appeals could not have read web flexibility, or the like, into any claim in suit, for to have done so would have violated a cardinal rule of patent law long since promulgated by this Court and always followed by the Court of Appeals even down to recent decisions written by Judge Simons himself.

(2) The Court of Appeals could not have predicated patentability upon web flexibility, or any other one element or feature of the novel combinations, for to have done so would have been to have violated a cardinal rule of patent law long since promulgated by this Court and always followed by the Court of Appeals even down to recent decisions written by Judge Simons himself and declared by the Court of Appeals to be followed in the instant causes (92 Fed. (2) 333).

(3) Even if scale drawings are no longer acceptable in patents, but must be dimensioned, the patent drawings which are scale drawings and included in the patents already issued should not be discarded, but should be relied upon since they have always been relied upon in the past and were relied upon when the patents in suit were issued.

(4) The "strict rule" of interpretation of a patent disclosure made by this Court in its opinion in these

causes and in *Permutit v. Graver* and *Powers v. Kennedy*, as now interpreted, should be applied to the prior art as well as to the patents in suit since it has always been the rule that the same rules of sufficiency of disclosure apply to both alike. As the case now stands, the "strict rule" has been applied to the patents in suit and the former "liberal rule" to the prior art. If the "strict rule" is applied to the prior art as well as to the patents in suit, the same end will be reached as was reached by the Court of Appeals in applying the "liberal rule" to each the patents in suit and the prior art, for the reason that if the "strict rule" is applied to the prior art there will be no prior art to impose upon the claims limitations requiring the reading of web flexibility into them.

B.

Is not the "strict rule" inconsistent with what is commonly and generally accepted in the art as a disclosure sufficient to teach those skilled in the art all the statutes require?

In view of the fact that the "strict rule" of disclosure which this Court has now made and upon which this Court stands is contrary, as the opinion of this Court says, to so many tribunals, including the three Courts of Appeals, we ask a rehearing that we may invite this Court to consider disclosures of pistons which those skilled in the piston art have considered to be such full, clear, concise and exact terms as to enable any person skilled in the art to construct and use a new piston, and what those skilled in the art considered to be a sufficient explanation of the principle of a piston and the best mode in which it is to be applied and how it is to be distinguished from other

pistons, to paraphrase the language of Section 4888, as this Court did at page 7 of its opinion.

The record contains a number of articles prepared by those skilled in the piston art and either read by them at engineering societies, or published in journals, or both, which articles were compiled for the purpose of disclosing the pistons there discussed in such full, clear, concise and exact terms for the purpose of teaching their readers or auditors to construct the pistons and which articles have explained the principles and the mode of using the pistons, etc. *In other words, we have here many practical demonstrations of what the piston art not only considers sufficient to disclose a piston, its principle, etc., but what has actually been sufficient for that purpose.*

We will take these up in order as they appear in the record. They are as follows:

(1) At page 1647 of the record there is an article by Harry R. Ricardo, B.A., A. M. I. C. E. No one can challenge the standing of Mr. Ricardo in the automotive industry. No one can challenge his skill in that industry or his knowledge of what constitutes a sufficiency of disclosure to those skilled in the piston art. An inspection of that article shows that his disclosure is more meager than the disclosures of the patents in suit. His drawings are not dimensioned and his descriptive matter contemplates resort to the drawing as sufficient. His drawings are no more elaborate than those of the patents in suit and his description is much more meager.

(2) At pages 1667 to 1669 of the record there is an article by the well-known automobile engineer, E. G. Gunn, which is reprinted in several automobile journals. *Mr. Gunn uses a little over two pages to illustrate and*

describe eleven different pistons. His drawings are not dimensioned though he relies largely upon the drawings for his disclosures. It is significant that he discusses a Long type of piston which has been said in these causes to have flexible webs. He considered it sufficient description to say that the piston of this type was allowed "to spring" without mentioning that the spring is due to the flexibility of the webs or is in the webs, or is in the skirt.

(3) There are two articles at pages 1827 to 1834 of the record describing machinery and including a description of pistons. Again drawings are relied upon. The only dimensions employed are shown at page 1828 and only the overall dimensions are given to show the size of the piston for a certain cylinder. Dimensions of wall thicknesses and such things are not given. These articles, like the Gunn article and the Ricardo article, are addressed to those skilled in the art and considered to be sufficient to disclose the pistons to those skilled in the art so as to enable the art to reproduce them and to realize their principles of operation.

(4) At pages 2229 to 2235 there are other articles published relating to pistons including the Spillman & Mooers piston. Again we find undimensioned drawings accompanied by description much more brief and barren of detail than the descriptions of the patents in suit, yet these are disclosures which the authors, who were skilled in the art, considered sufficient to convey to their readers, also skilled in the art, the information to enable them to reproduce the pistons and to take advantage of their principles of operation.

(5) At page 2271 of the record there is a publication by Mr. Long himself addressed to garagemen, mechanics,

engineers and others in the art for the purpose of explaining his piston to them and its principle of operation so as to induce them to employ it. It will be noted that Mr. Long relies largely upon an undimensioned illustration of his piston and that in order to explain the operation of the piston,—which is now thought by this Court to include web flexibility,—he considered it sufficient to tell the art that the piston permitted "expansion"—a word used by both Gulick and Maynard in their disclosures, but in more elaborate context. There can be no doubt that Long is skilled in the art, and that his disclosure was addressed to those skilled in the art, with the intention of informing them of the structure of his piston and how to operate it.

(6) At pages 2273 to 2275 of the record there is an article by a Mr. Walford, and addressed to those skilled in the piston art, where he describes a split type of piston, relying largely upon an undimensioned drawing. He did not consider it necessary to mention the fact that the portions of the piston would expand or that the material of which it was made was resilient; yet his purpose was to disclose to those skilled in the art his piston and its principles.

(7) Even more abbreviated are the disclosures by Sterling Products Corporation at page 1326 of the record and by Weems, the licensee of Long, at page 1621 of the record.

Each and every one of these disclosures was offered in this record by the petitioners, who urged that the disclosures were sufficient to teach those skilled in the art how to make the pistons illustrated and described in these articles and how to operate them to make their principles available to the public.

We, therefore, wonder if this Court would not, upon reconsideration, think that the former or "liberal rule," as we have called it, was more consistent with the actual facts and the practical side of the piston business and science than the "strict rule," and, further, and if this Court would not think that the "strict rule" was inconsistent with and more or less flies in the face of what the art considers to constitute a disclosure sufficient to those skilled in the art, as so amply established by the publications to which we have referred.

The authors of this brief are familiar with the literature on pistons made up of disclosures in textbooks, engineering society papers, read and discussed at engineering society meetings, articles published in scientific and trade journals, etc., such as are found in any modern science or art. We regard the articles appearing in the record in these causes which we have discussed above as typical of the literature and of what has not only been regarded by those in the art, but has been in experience found by those in the art, to be sufficient to disclose the pistons, their principles of operation and how to apply them. We do not believe that the literature of the piston science or the piston art contains a description that would conform to the rule made by this Court in its opinion in the instant causes.

WHEREFORE, it is prayed this Court grant a rehearing in the above entitled causes.

Respectfully submitted,

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Attorneys for Respondents.

November 30, 1938.

I certify that the foregoing Petition for Rehearing is filed in good faith and not for purposes of delay.

WM. C. MCCOY.

APPENDIX A.

The Ebbs piston (this Court's opinion, p. 4) not only does not describe "flexibility of the skirt," but the purpose for which Ebbs showed replaceable skirt portions did not contemplate flexibility in the skirt portions. All that Ebbs provided was skirt portions which could be removed when worn and new ones substituted. He contemplated no skirt flexibility and in the use for which his piston was designed there would have been no skirt flexibility (R. p. 945). We presume that it might be argued that since all metal is inherently flexible, the parts would have flexed if somebody had taken them out of the cylinder and put enough pressure on them to make them flex, but under the rule of this Court expressed in its opinion of November 7, 1938, this flexibility could not be imported into the Ebbs patent. Nor can any of the other seven items of Gulick or ten items of Maynard be read into Ebbs, if for no other reason than that they are not there disclosed under the "strict rule."

The Van Bever patent does not show "flexibility of the skirt." The most that Van Bever claims is that the skirt portions "have a certain amount of springing capacity." *This "springing capacity" does not exist when the piston is completed; it is present only in the incompleted piston.* It is employed only for the purpose of permitting the manual adjustment of the piston skirt when it is outside of the engine. The Van Bever piston, therefore, not only does not possess "flexibility of the skirt," but the "springing capacity" present in the incompleted piston does not contribute to automatic adjustment of the piston skirt to take care of the expansion and contraction. The Van Bever piston does not automatically contract and expand when in use; it is just as dead and as rigid as a trunk piston. The skirt does not flex when it is in use. It was merely intended to be flexed when the piston was taken out of the cylinder and adjusted by hand. The record further shows that the ad-

justing means was omitted from the Van Bever piston and that it was used in a cylinder in an attempt to make it flex and take care of the expansion and contraction taken care of by the pistons of the patents in suit. The record shows, however, that it would do no such thing, and, further, that it was incapable of flexing to do what is done by the pistons of the patents in suit and was given up as a failure (R. pp. 452, 546-548, 572 and 930). The principal testimony on this subject was given by defendant's expert who made the attempt and experienced the failure when he was an engineer and later the Chief Engineer of the Franklin Company (R. pp. 449 and 543). The seven other Gulick and ten other items of Maynard cannot be read into Van Bever, under the "strict rule."

At the threshold of the consideration of these questions, it must be remembered that there are various kinds of flexibility. For example, a springboard is flexible; so is a thread, but the kind of flexibility possessed by the thread would not serve in the springboard and the kind of flexibility in the springboard would not serve in the thread.

To import into the completed Van Bever patent flexibility that it does not possess and that the evidence shows it is incapable of possessing, would not only violate the rule laid down by this Court in its opinion of November 7, 1938, but would violate the long established cardinal rule of patent law that two things are not the same, even though a word can be discovered which describes them both, where the one is incapable of performing the offices of the other or performing those offices in the same way, such, for example, as the springboard and the thread, and the Van Bever piston and the patented pistons (See *Machine Co. v. Murphy*, 97 U. S. 120, 125).

The Franquist patent No. 1,153,902 does not disclose "flexibility of the skirt." If it attains flexibility it is only by virtue of undisclosed antithetical properties inherent in

the materials of which the piston is made and, even then, as we shall point out later, flexibility would be achieved by a different mode of operation and to a too limited extent to be commercially successful. It is true that the Franquist patent prophesies that the Franquist piston will be circumferentially compressible under the pressure of the cylinder wall and when the cylinder retires the piston will resume its normal size, just as Gulick, in his original specification, claimed that his piston would not "expand against the cylinder wall to such an extent as to seize or stick" and with not enough force "to cause the piston to stick in the cylinder." *Franquist no more describes the properties of the materials of which his piston is made whereby this can be done than Gulick did in his original specification.* Franquist says that his piston will operate by circumferential compression, just as Gulick says that his piston will not expand against the cylinder wall with too much pressure, but Franquist no more states what property of the metal he employs or the actual dimensions used which cause his piston to yield to circumferential compression than Gulick did in his original specification. In other words, Franquist depended upon flexibility to accomplish his purpose of yielding in response to circumferential compression and resuming the normal size when the pressure was relieved, just as Gulick is said to have depended upon flexibility of the web. There is no doubt that whatever flexibility is present in Franquist's skirt is antithetical for the same reason that flexibility in Gulick's web is antithetical. Franquist's skirt possessed rigidity if it possessed flexibility, just as Gulick's web did. The situations with respect to the Franquist skirt is precisely what this Court said about the Gulick web, and if Gulick's original disclosure was insufficient because he neglected to mention the inherent antithetical property of flexibility in his web through which aid was given to the

ability of the piston not "to expand against the cylinder wall to such an extent as to seize and stick," then by the same rule and measure the Franquist patent disclosure is insufficient for failure to state that it is through the antithetical property of flexibility that the skirt can yield to circumferential compression and resume its original position when the circumferential pressure is relieved. In addition to that we will point out that Gulick did operate as he claimed to produce a useful piston and Franquist did not.

What we have said about the comparisons we have made between Franquist and Gulick applies likewise between Franquist and Maynard. Maynard states that his structure "compensates for expansion and permits the skirt to conform to the cylinder," just as Franquist claims that his skirt yields to circumferential compression and then resumes its normal size when the pressure is relieved. *If the Maynard description is insufficient because it neglected to mention the inherent antithetical property of flexibility, through which the compensation to which he refers is aided, then the disclosure of Franquist is insufficient because he fails to do the same thing.*

It follows that the Franquist patent cannot be used to limit either the Gulick or Maynard claims in suit so that web flexibility must be read into them to make them valid.

Nor can Franquist's drawings any more rescue his disclosure from the ban than can the drawings of Gulick and Maynard, because neither the drawings nor the specification of Franquist "gives dimensions showing thickness or other proportions which might suggest a flexible structure" any more than Gulick or Maynard do.

Franquist cannot be rescued from this situation by the claim that it was demonstrated that his piston would be flexible if made according to the drawing because the same thing has been shown of Maynard and Gulick. Moreover, there is no evidence that anyone knew that Franquist was

flexible prior to the inventions of Gulick and Maynard, and there is ample evidence that both Gulick and Maynard were known to be flexible long prior to the infringement.

The Franquist patent contemplated expansion and contraction upon a different mode of operation called in the Franquist patent "circumferentially compressible" and in this record and in the opinion of this Court and in the opinion of the Court of Appeals as "the accordion principle." On this principle, as the record shows, only limited contraction and expansion could be realized and that limited expansion and contraction was insufficient to improve upon the ordinary trunk type of piston which was superseded by the pistons of the patents in suit because they did operate upon a different principle than that of Franquist and failed. Therefore, we say that under the ruling of this Court in its opinion in these causes, the accordion principle cannot be read out of Franquist and the cantilever principle be read in. We also say that there cannot be *imported into Franquist sufficient flexibility* to be commercially operative and successful when the record shows that the amount of expansion and contraction actually disclosed and realized is insufficient to be either commercially operative or successful. Franquist fails to disclose the other items of the Gulick and Maynard itemization under the "strict rule," as we have shown *supra.*

The Long Patents (this Court's opinion, p. 4) instead of disclosing flexibility, disclosed rigidity both in skirt and web.

The Long patent shows a plurality of skirt portions 6 each of which, as the specification of the Long patent 1,872,772 says, "is held in its peripheral position by an integrally formed connecting portion 10" (R. p. 1737, ls. 54 and 55) and "the separated portions 6 will be *rigidly* held against bending" (R. p. 1738, ls. 32 and 33). The only way in which these sections 6 can be rigidly held in this manner is by the

provision of rigid webs 10; in other words, in Long the webs 10 could not both bend and hold the portions 6 rigidly against bending as stated. Moreover, this declaration that these skirt portions are held against bending, negatives any claim that they bend in operation; *in other words, according to the Long specification neither the skirt portions nor the webs are flexible.*

These statements and the facts recited therein cannot be overcome by any claim that Long had his piston in commercial use early enough to be prior art to Maynard—though not to Gulick—on the theory that there was an admission that the Long web was flexible because it was never admitted that the Long web was flexible enough to flex in use.[1] Such a statement would not only have been contrary to the teachings of the Long patent, but it would have been contrary to the experience of the Franklin Company with the Long piston. The record shows that the Franklin Company had to give the Long piston .004" to .005" clearance, from which it is clear that it could not be used at .002" clearance. It was equally clear that the reason that it could not be used with less than .004" to .005" clearance was because the webs would not flex in use (p. 458). If they had flexed in use the piston could have been used at .002" clearance. For the reasons we have said *supra*, other features listed by this Court and the Court of Appeals in discussing Gulick and Maynard cannot be imported into any of the Long patents, under the "strict rule."

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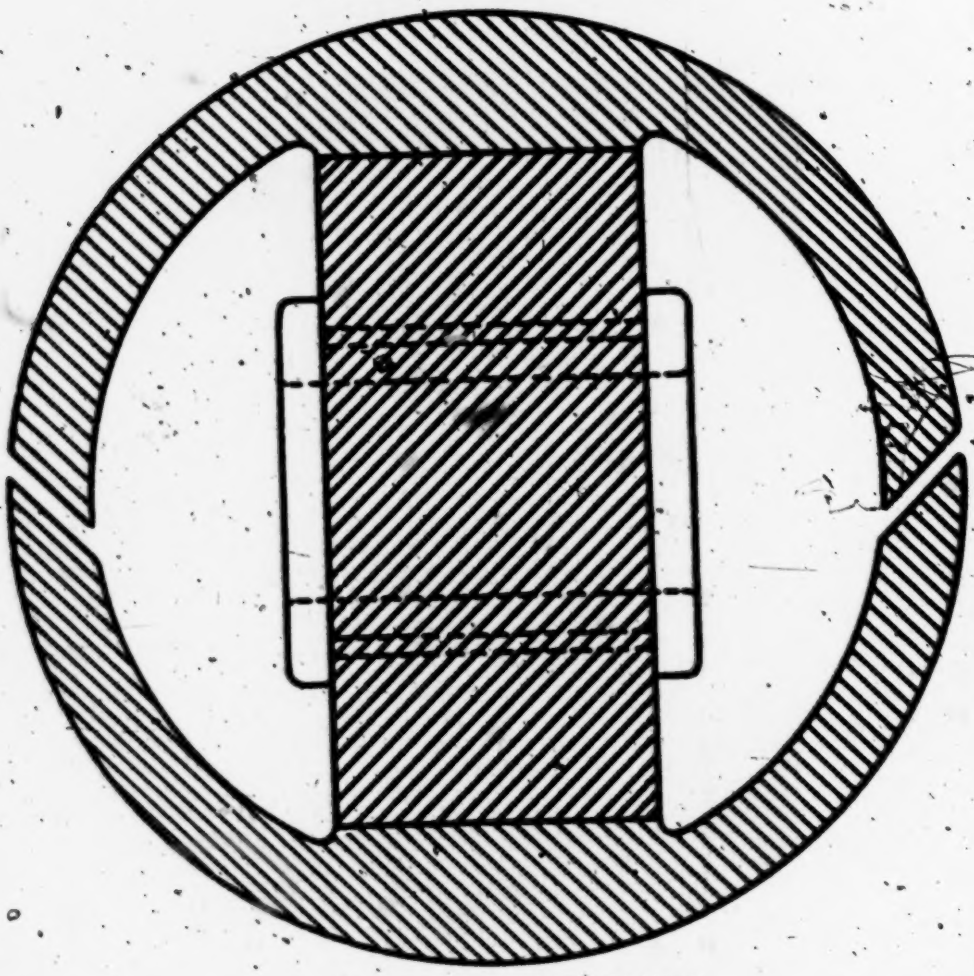
[1] If the failure of a prior art patentee to disclose inherent flexibility in his patent, or to recognize it in his structure, can be cured by an admission made after the patented inventions were made, that flexibility would be present, then the failure of the Gulick and Maynard patents to disclose the flexibility in their original disclosures is cured because there are admissions here that flexibility is present in their disclosures supported by proof of the fact and, in the case of the Maynard patent, by proof of the use of millions of his pistons. (R. pp. 201, 568, 578, 462, 471, 955.)

The only other prior art piston that was mentioned either by this Court or by the Court of Appeals in connection with the dissection of the combination claim into its individual elements was the Spillman & Mooers patent. The Spillman & Mooers patent does not say that the Spillman & Mooers skirt is flexible. Under this Court's rulings these terms could not be *imported into Spillman & Mooers* even if it were possible to have flexed either web or skirt in the Spillman & Mooers construction.

APPENDIX B.

The drawings of the patent in suit each are scale drawings. The shape and proportions of each part of the webs of both Gulick and Maynard pistons are clearly shown in the drawings together with the exact position of these webs in the piston structures. In Gulick, for example, the shape or form of the webs is shown in plan view in Fig. 1, the thickness of the webs is shown in edge view in Fig. 2, the thickness of the webs is again shown in sectional view in Fig. 3, and in the sectional view in the plane of the bosses in Fig. 4. No such complete and accurate showing of any piston structure of the prior art is found in this record. Any mechanic could exactly reproduce in the piston structure the relative size, the form, thickness, and all other proportions of these webs and each of the parties did reproduce the piston of the Gulick patent, including the webs, and each structure so reproduced by the parties has webs that are extremely rigid in the direction of the web and that are also laterally flexible, as may be determined by manually squeezing the pistons Exhibit 3-T (Petitioner's) or Exhibit 20 (Respondent's) to close the longitudinal slots in those pistons. The drawings of the Gulick piston are found at R. p. 284 and of Maynard at R. p. 300. For convenience the piston of the Gulick patent is reproduced in perspective from the patent drawings in the proportions of the patent and is shown in the plate at the back of this brief. Arrows "a" and "b" are applied to this drawing to show the directions of the "extremely rigid" web connection between the power-transmitting bosses 16 and the piston skirt that is "in addition to" the split skirt that will not "seize or stick." Arrow "c" shows the "lateral flexibility" described in the amendment and that permits the originally described operation of the split skirt.

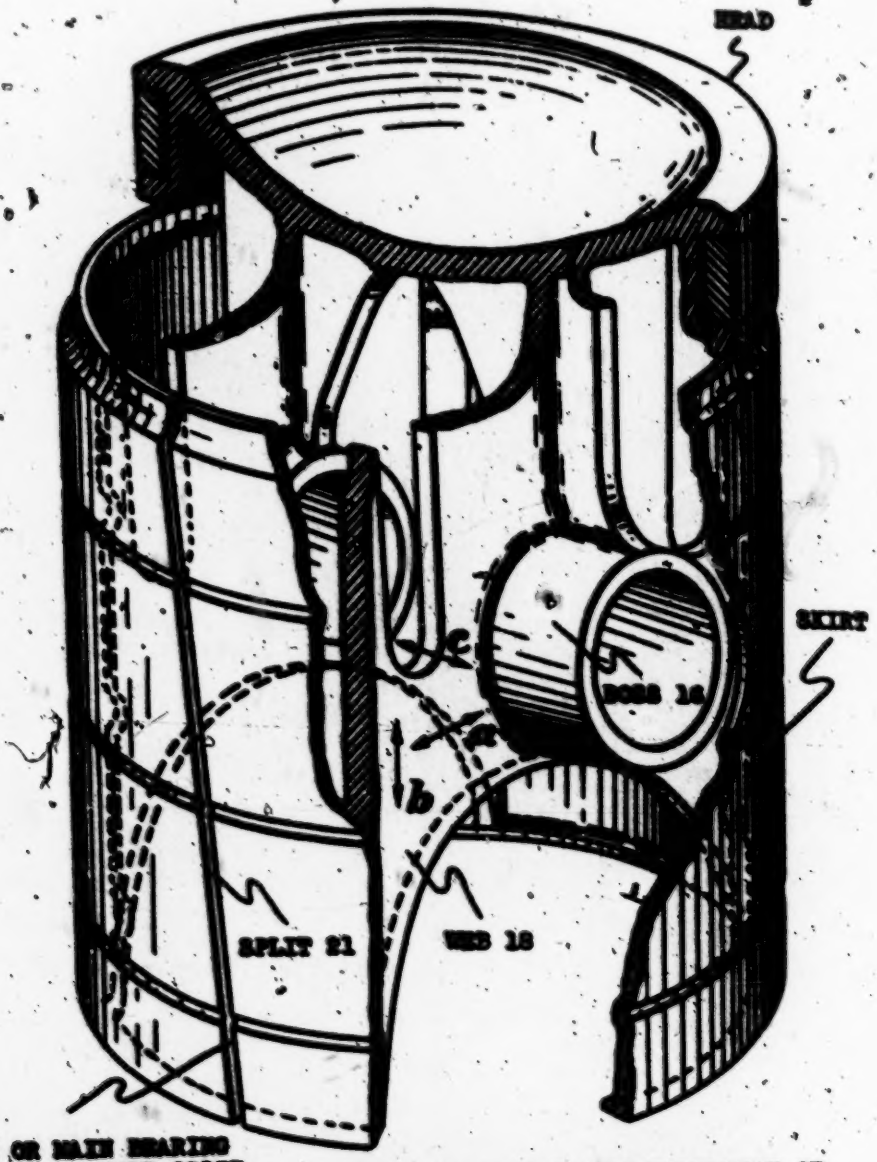
MAIN THRUST BEARING FACE



MAIN THRUST BEARING FACE

SECTION OF ERBS PISTON ABOVE WRIST PIN BOSS.

Solid metal connection between main thrust bearing faces makes piston rigid. Skirt is split in axis of wrist pin boss, not in main bearing face.



SPLIT

GUIDE OR MAIN BEARING PORTION OF SKIRT SPLIT FROM TOP TO BOTTOM AT 21 SO THAT SKIRT WILL NOT "SEIZE OR STICK" IN THE CYLINDER.

ARROWS "a" AND "b" SHOW DIRECTION OF "EXTREMELY RIGID CONNECTION" OF THE POWER-TRANSMITTING BOSSES 16 TO THE SKIRT BY THE WEBS 18. ARROW "c" SHOWS DIRECTION OF "LATERAL FLEXIBILITY" (ADDED BY AMENDMENT) OF THE WEBS 18.

VIEW OF GULICK PISTON IN PERSPECTIVE.

pp. 1-4.

SUPREME COURT OF THE UNITED STATES.

Nos. 3, 4, 5.—October Term, 1938.

The Schriber-Schroth Company, Petitioner,
vs.
The Cleveland Trust Company, Chrysler Corporation.

The Aberdeen Motor Supply Company, Petitioner,
vs.
The Cleveland Trust Company, Chrysler Corporation.

The F. E. Rowe Sales Company, Petitioner,
vs.
The Cleveland Trust Company, Chrysler Corporation.

On Writs of Certiorari to the United States Circuit Court of Appeals for the Sixth Circuit.

[November 7, 1938.]

Mr. Justice Stone delivered the opinion of the Court.

The principal question for decision is whether the court below rightly sustained the validity of two patents by including in the combination constituting the alleged invention of each an element which was not in terms described in one, and the description of which in the other was added only by amendment to the application after it was filed.

"Respondent, the Cleveland Trust Company, is the assignee in trust of some eighty patents relating to pistons of the type employed in internal combustion engines for automobiles, under a pooling agreement to which an automobile manufacturer and a number of manufacturers of pistons are parties."

was tried before a special master who, upon the basis of elaborate findings, held that the Gulick patent, No. 1,815,733, applied for November 30, 1917 and allowed July 31, 1931, was invalid for want

of invention and because of the addition to the application by amendment in 1922 of a new element of the alleged invention. In reaching this conclusion he relied on this Court's decisions in *Powers-Kennedy Co.* v. *Concrete Co.*, 282 U. S. 175 and *Permutit* v. *Graver Corporation*, 284 U. S. 52, as inconsistent with the result of interference proceedings in which Gulick's amendments were sustained, *Long* v. *Gulick*, 17 F. (2d) 686, *Hartog* v. *Long*, 47 F. (2d) 369. The master also held that the Maynard patent No. 1,655,968, applied for January 3, 1921 and allowed January 10, 1928, was invalid for want of invention and for failure to describe and claim the alleged invention. He held invalid upon various grounds the other patents, which are not presently involved.

The District Court adopted the findings and conclusions of the master and gave its decree for petitioners. The Court of Appeals for the Sixth Circuit reversed, as to the Gulick and Maynard patents only, holding that they were valid and infringed. 92 F. (2d) 330.[1] As the court regarded the claims which it sustained as basic and thought that a full recovery could be had by respondent under them, it did not pass upon the validity of the other patents or decide other questions involved in the appeal.

Petition for certiorari raising the question, among others, whether the Court of Appeals had erred in holding patentable a combination including one element not described in the original application for the Gulick patent and later added to it by amendment, and not described at all in the Maynard patent, was at first denied, there being no conflict of decision. 303 U. S. 639. We later granted certiorari, — U. S. —, on a petition for rehearing showing that, notwithstanding the doubtful validity of the patents, litigation elsewhere with a resulting conflict of decision was improbable because of the concentration of the automobile industry in the sixth circuit. Cf. *Paramount Publix Corp.* v. *American Tri-Ergon Corp.*, 294 U. S. 464; *Altoona Publix Theatres, Inc.* v. *American Tri-Ergon Corp.*, 294 U. S. 477.

It is important for the proper functioning of the piston in a gas engine that it should fit the explosion chamber closely so as to conserve power, prevent the passage of lubricating oil around the piston into the chamber, and insure the smooth and noiseless move-

[1] The decree sustained Gulick's claims numbered 1, 11, 12, 13, 15, 18, 30 and 33, and Maynard's claims numbered 1, 6 and 8.

ment of the piston within the cylinder. In designing gas engines for automobiles and other purposes requiring a high speed piston reciprocation with the accompanying development of high temperature in the explosion chamber, it is desirable to avoid thermal expansion of the close fitting piston, which will result in loss of power and possible injury to the mechanism through increased friction, which may cause the piston to seize or stick. The danger of undue expansion is increased when, as is advantageous in automobile engines, the piston is of aluminum, which has a higher coefficient of expansion than the iron or steel chamber within which the piston moves.

Both the Gulick and Maynard patents are for combinations in the structure of a piston for gas engines designed to prevent or restrict undue expansion of the piston when in operation. The Gulick patent exhibits a piston in which the ring-carrying head is separated by an air space at its periphery from the cylindrically shaped skirt or guide wall, whose surface engages the inner surface of the cylinder. The piston head and skirt are connected by two "webs" or walls extending longitudinally through the interior of the skirt. The webs are pierced at right angles for wrist pin bearings and support, at the bearings, piston pin bosses formed with integral flanges extending laterally from their respective bosses to form the webs, which in turn are integrally connected on either side with the interior wall of the lower part of the skirt and at their ends with the piston head. The skirt is longitudinally split on one side at a point in its circumference approximately midway between the pin bosses, with the edges of the skirt formed by the split separated so as to admit of the free movement of the edges toward each other.

The structure is thus designed to minimize the expansion resulting from high temperatures developed in the chamber and to avoid the effects of thermal expansion of the skirt. The webs, which afford at the wrist pin bearings the means for connecting the piston rod with the piston, serve to hold the head and skirt in proper relation to each other so that the air space between them retards flow of heat from the head to the skirt, undue expansion of the skirt, and the consequent increase of friction between piston and enveloping cylinder. Undue expansion of the piston is said by the patent's specifications to be avoided by the separation of the skirt by the longitudinal split in order to admit of unrestrained move-

ment of the edges of the skirt toward each other. Elsewhere they state that "when the longitudinal split is used, as shown, the web structure has sufficient lateral flexibility to permit the split to close more or less under the action of the expansion forces incident to the heating of the piston."

The elements of the combination as enumerated in Claim 39 are: "A piston, open at one end, for an engine cylinder comprising a skirt and head separated from the skirt wall around its entire periphery, said skirt being longitudinally split to render the skirt wall yieldable on every diameter in response to cylinder wall pressure, wrist pin bosses, and means rigidly connecting said bosses to the head and yieldingly connecting said bosses to the skirt whereby said skirt is yieldable in response to cylinder wall pressure."

"Reference to a combination including, with other elements, web connections, 'whereby said piston skirt is rendered yieldable during operation in response to cylinder wall pressure,' appears in Claim 18."

by an air space, the two being connected by webs supporting wrist pin bearings with bosses which do not come directly in contact with the walls of the skirt, was plainly foreshadowed by the prior art as a practicable means of minimizing the flow of heat from head to skirt and of securing lateral flexibility in the skirt. The expired Spillman and Mooers patent No. 1,092,870, of April 14, 1914, pooled with the patents in suit, showed a piston with head separated by an air space from the skirt, the two being connected by a web separated from the skirt except at the point of integral connection with it at the lower end of the cylinder, and providing bearings for a wrist pin connection with bosses not in direct contact with the wall of the skirt.

Flexibility of the skirt attained by longitudinal slits was old, as shown by the Ebbs patent No. 700,309 of 1902, and Van Bever, No. 1,031,212 of 1912. The Franquist piston, patent No. 1,153,902 of 1915, another of the pooled patents, which showed piston head partially separated from skirt by air spaces, attained flexibility of the piston wall by longitudinal grooves in the skirt which interrupted its outer periphery though connected at the inner edges of the groove by a fold of the metal on the accordion principle. The Long piston, patent No. 1,872,772 of 1932, which the master and the district court found was in commercial use from 1917 on, and before the amendment of the Gulick application, presently to be dis-

cussed, showed longitudinal slits cut through the skirt, which was separated by air spaces from the piston head, the two being connected by parallel webs pierced for wrist pin bearings.

The court below found invention in the Gulick disclosure in a combination of elements, of which one was webs "laterally flexible", which were not specifically so described in the Gulick application until the amendment of 1922. Conceding that the deceleration of the flow of heat from head to skirt by an air gap might be an obvious expedient of the art, and that to slit the skirt vertically so as to compensate for thermal expansion might not be beyond the skill of the art, the court added: "But to combine insulation of head from skirt, retraction of the bosses from the skirt periphery, connection of such bosses to the skirt with webs laterally flexible and yet so carried from the head as to support the load upon the wrist pin with sufficient strength and rigidity and to utilize the mechanical force of the cylinder wall upon the skirt and the thermal expansion of the bosses so as to compensate evenly and fully for head expansion and to secure a balanced flexibility of the skirt with no bending concentration at any point therein, discloses we think a meritorious concept beyond the reach of those skilled in the art." 92 F. (2d), at 334.

We can find no support in the opinion for the contention of respondent that the Circuit Court of Appeals did not consider the flexible web an essential element in Gulick's invention. Its enumeration, among other named elements, of the connection of head and skirt by webs laterally flexible as embodying a meritorious concept must be taken to indicate that the court regarded the flexible webs as a part of the invention, the more so since it indicates that lateral flexibility of the webs is the only feature mentioned not within the prior art or within the expected skill of the art. It rejected, on the authority of *Long* v. *Gulick, supra*, and *Hartog* v. *Long, supra*, the contention made below and pressed here that Gulick's application as filed did not disclose "webs laterally flexible" and the resultant "balanced flexibility of the skirt," and that those features were added to specifications and claims after the use of the Long piston and after they had appeared in Hartog.

The Gulick application, which was filed November 30, 1917, contained no reference in terms to laterally flexible webs or to the function of the webs in securing flexibility of the skirt. The

specifications pointed to no inadequacy in the structure or function of webs of the prior art which would be remedied by the webs specified and to no function to be performed by them other than as a means of connecting and holding head and skirt so as to maintain the air gap between them and to support the wrist pin bearings and their bosses as both were shown in Spillman and Mooers. On the contrary, Gulick's application described the webs as "extremely rigid" and stated that an object of the invention was "to rigidly support the piston pin bosses of a piston from the piston walls." The only description of the web structure was as follows:

"It will be seen that in addition to providing a piston with a split skirt the above described construction also provides an extremely rigid connection between the piston pin bosses and the skirt of the piston, which construction may be used either with or without the split skirt and separated head. The arrangement of the supporting flanges 17 between the ends of the piston pin bosses and the connection of those flanges with the piston skirt provide a particularly strong support for the bosses."

The webs as shown by the drawings conform to the specifications of an "extremely rigid connection" between piston pin bosses and skirt and "a particularly strong support for the bosses." They form chords subtending the arc of the circle of the skirt, with flanges depending from the head to the bosses at right angles to the webs, and the skirt as shown is provided with interior corrugations and with an inturned flange at the bottom, all familiar devices for securing rigidity of structure. Neither drawings nor specifications give dimensions showing thickness or other proportions which might suggest a flexible structure.

In 1922, after the Long piston, whose webs concededly were laterally flexible, was in commercial use, and Hartog, to the knowledge of Gulick's assignee, had specified and claimed a yieldable web, Gulick copied the Hartog claim and amended his specifications so as to state that one of the objects of his invention was "to rigidly support the piston pin bosses of a piston from the piston wall against mechanical load thrust from the connecting rod without interfering with the yielding characteristics of the skirt in response to cylinder wall pressure." And he amended his description of the web structure to read:

"The arrangement of the supporting flanges 17 between the ends of the piston pin bosses and the connections of those flanges with both the piston guide portion and the head provide a particularly strong construction, and at the same time, when the longitudinal

split is used, as shown, the web structure has sufficient lateral flexibility to permit the split to close more or less under the action of the expansion forces incident to the heating of the piston."

Petitioners insist that the flexible web element of the Gulick combination, as found and sustained by the court below, is excluded from the Gulick patent by reason of his failure to describe that element in his application as filed and that he could not cure the omission and secure a patent embodying that feature by substituting by way of amendment "webs laterally flexible" for "extremely rigid webs" in the description of his invention. The statute, R. S. § 4888, provides that the application which the inventor must file as a prerequisite to a patent shall contain "a written description of [his invention] . . . and of the manner and process of making, constructing . . . and using it in such full, clear, concise, and exact terms as to enable any person skilled in the art . . . to . . . construct . . . and use the same; and in case of a machine, he shall explain the principle thereof, and the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions. . . ."

The object of the statute is to require the patentee to describe his invention so that others may construct and use it after the expiration of the patent and "to inform the public during the life of the patent of the limits of the monopoly asserted, so that it may be known which features may be safely used or manufactured without a license and which may not." *Permutit Co.* v. *Graver Corporation*, 284 U. S. 52, 60. It follows that the patent monopoly does not extend beyond the invention described and explained as the statute requires, *Permutit Co.* v. *Graver Corporation*, *supra*, at 57; that it cannot be enlarged by claims in the patent not supported by the description, *Snow* v. *Lake Shore Railway*, 121 U. S. 617; cf. *Smith* v. *Snow*, 294 U. S. 1; and that the application for a patent cannot be broadened by amendment so as to embrace an invention not described in the application as filed, at least when adverse rights of the public have intervened. *Railway Co.* v. *Sayles*, 97 U. S. 554, 563, 564; *Powers-Kennedy Co.* v. *Concrete Co.*, 282 U. S. 175, 185-186; cf. *Webster Electric Co.* v. *Splitdorf Electrical Co.*, 264 U. S. 463; *Permutit Co.* v. *Graver Corporation*, *supra*; *Crown Cork & Seal Co.* v. *Gutmann Co.*, 304 U. S. 159.

Respondent earnestly argues, as both courts held in the interference proceedings, *Long* v. *Gulick*, *supra*, and *Hartog* v. *Long*,

supra, that the changes in Gulick's application were not alterations in the description of his invention but were at most a permissible clarification of its description of the flexible web element which was present, or at least plainly suggested, in the specifications and drawings of the Gulick application. Flexibility, it is said, as is well known to those skilled in the art, is an inherent property of the metal out of which the webs are made, and in consequence reference to the webs in the application as filed was sufficient to import into it as a part of the description of the invention their known quality of flexibility, a description which was made more specific, but not altered, by the amendments. The argument suggests that it was but the skill of the art, and not invention, to substitute a flexible for a rigid means of connecting head and skirt in a known combination of piston head separated from a slitted skirt by an air space and connected by webs. But in any case we think it falls short of establishing that the Gulick amendments were not new matter beyond the scope of the device described in the application as filed.

The properties of any given material are many and diverse. The antithetical qualities of rigidity and flexibility of a structure are not absolute but relative; it may be more rigid than some and more flexible than others; too rigid for some purposes and too flexible for others. The one quality may be increased and the other diminished by choice of materials from which the structure is made and by variation in its proportions. If invention depends on emphasis of one quality over the other, as the court below found was the case with the laterally flexible webs in the Gulick device, the statute requires that emphasis to be revealed to the members of the public, who are entitled to know what invention is claimed. That is not accomplished either by naming a member having inherent antithetical properties or by ascribing to it one property when the other is meant. Since rigidity is a relative term, the characterization of the structure as rigid must be taken as emphasizing rigidity rather than its opposite, flexibility, with special reference to the conditions to be encountered in the operation of the piston. Even if those skilled in the art would have known that a piston with webs which would yield enough laterally to accommodate the constriction of the split skirt under the pressure developed by thermal expansion would work most effectively if the webs were laterally flexible rather than rigid, that was not the inven-

tion which Gulick described by his references to an extremely rigid web.

Gulick also failed to explain the principle of his machine so as to distinguish it from the prior art. Webs having the inherent properties both of rigidity and flexibility were familiar elements in piston structure. The court below, after pointing out that the slots of the Franquist skirt rendered it capable of limited constriction, found a distinguishing feature of Gulick's piston to be a web relatively flexible laterally, so as to accomodate the constriction of skirt to thermal expansion, the combination operating to secure a "balanced flexibility" of the skirt. But that principle—facilitating skirt constriction rather than obstructing it—was first explained and its embodiment in the flexible-webbed device was first claimed by the amendments to the application.

As already indicated, the omission from the specifications was not supplied by the drawings, which failed to disclose by dimensions the proportions of the webs. Inherent flexibility of the web in cooperation with the slit skirt cannot be depended upon to produce the desired effect in rendering the skirt yieldable in response to cylinder wall pressure. As respondent's own expert testified, that depends upon design of the web, with correct proportioning of the different parts as to location and thickness to produce lateral flexibility. Inherent rigidity, made more effective by design of the webs, would correspondingly curtail the desired effect.

We recognize the weight to be attached to the determinations in the interference proceedings in which the Court of Appeals of the District of Columbia and the Court of Customs and Patent Appeals sustained the Gulick amendments. Cf. *Radio Corporation* v. *Radio Laboratories*, 293 U. S. 1, 7. But the decisions in those cases are not controlling here. So far as the courts relied on the inherent flexibility of the webs to supply the feature of lateral flexibility omitted from the Gulick description they ignored the principle recognized in *Permutit* v. *Graver Corporation*, *supra*, and *Powers-Kennedy* v. *Concrete Co.*, *supra*. So far as they relied on the drawings to supply the omission they disregarded the fact shown both by inspection and by the evidence presented here that the drawings do no more to point to Gulick's invention than does the fact of inherent flexibility. We conclude that respondent can take no benefit from the flexible web element added by amendment to the Gulick application.

In sustaining the claims of the Maynard patent the court below said that "Maynard . . . embodies the Gulick combination of skirt insulation, skirt flexibility by means of vertical slotting cooperating with longitudinal slotting, and flexible webs in the region of the wrist pin bosses. He also follows Jardine's simplified design to permit economical manufacture and Jardine's boss relief", and after enumerating certain mechanical features of the Maynard construction differing from Gulick and Jardine, concluded: "It is clear that Maynard, while not departing from the teaching of Gulick in basic combination of elements, discloses a piston lighter and more economical of manufacture than Gulick and one more rugged and durable than Jardine." 92 F. (2d), at 337.

Invention over Gulick and Jardine was apparently found in the details of construction but, as we are without other indication of the character of the invention, we construe the court's opinion as including the laterally flexible webs as an essential element in the patented combination. As flexible webs are neither described in Maynard's specifications nor mentioned in his claims, they can be imported into them only by reference to the drawings or by inference from the inherent flexibility of the structure, which, for reasons already given in our consideration of the Gulick amendments, are insufficient to accomplish that result. We conclude that the court below erred in giving any effect to so much of the Gulick patent as by amendment describes or claims the flexible webs, and in treating any of the specifications or claims in Gulick and Maynard as referring to such webs. We assume that it sustained Claim 1 of the Gulick patent, which makes no mention of web flexibility, only by reading into it that element, which the court regarded as an essential part of the invention.

As the Court of Appeals did not pass upon other questions in the case, the causes will be reversed and remanded to it for further proceedings, in conformity with this opinion, with respect to such claims of the patents in suit as appellant below submitted to that court for adjudication.

Reversed.

Mr. Justice Roberts took no part in the consideration or decision of this case.